

<b>Prüfbericht-Nr.:</b> <i>Test report no.:</i>	<b>60359686 001</b>	<b>Auftrags-Nr.:</b> <i>Order no.:</i>	<b>238133983</b>	Seite 1 von 47 Page 1 of 47
<b>Kunden-Referenz-Nr.:</b> <i>Client reference no.:</i>	<b>N/A</b>	<b>Auftragsdatum:</b> <i>Order date:</i>	<b>2019.11.28</b>	
<b>Auftraggeber:</b> <i>Client:</i>	Microchip Technology Inc. 2355 West Chandler Blvd. Chandler, Arizona 85224-6199, United States.			
<b>Prüfgegenstand:</b> <i>Test item:</i>	2.4GHz Wi-Fi® Module			
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type no.:</i>	WFI32E01PE, WFI32E01UE, WFI32E01PC, WFI32E01UC			
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	FCC Part 15C/ ISED RSS-247 Test report (Wi-Fi 2.4G)			
<b>Prüfgrundlage:</b> <i>Test specification:</i>	FCC 47CFR Part 15: Subpart C Section 15.247(DTS) ISED RSS-247 Issue 2 March 2017			
<b>Wareneingangsdatum:</b> <i>Date of sample receipt:</i>	2020.01.08			
<b>Prüfmuster-Nr.:</b> <i>Test sample no.:</i>	Refer to Page 13			
<b>Prüfzeitraum:</b> <i>Testing period:</i>	2020.01.08 - 2020.05.01			
<b>Ort der Prüfung:</b> <i>Place of testing:</i>	EMC/RF Laboratory Taipei			
<b>Prüflaboratorium:</b> <i>Testing laboratory:</i>	Taipei Testing laboratories			
<b>Prüfergebnis*:</b> <i>Test result*:</i>	Pass			
<b>rüft von:</b> <i>reviewed by:</i>	<b>genehmigt von:</b> <i>authorized by:</i>			
<b>Datum:</b> 2020.05.12 <i>Date:</i>	 Jack H.C Chang	<b>Datum:</b> 2020.05.12 <i>Date:</i>	 Ryan W.T. Chen	
<b>Stellung / Position:</b>	<b>Project Manager</b>	<b>Stellung / Position:</b>	<b>Project Manager</b>	
<b>Sonstiges / Other:</b>				
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient N/T = not tested
<p><b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b> <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i></p>				

## TEST SUMMARY

### 5.1.1 ANTENNA REQUIREMENT

RESULT: *Passed*

### 5.1.2 PEAK OUTPUT POWER

RESULT: *Passed*

### 5.1.3 6dB BANDWIDTH AND 99% BANDWIDTH

RESULT: *Passed*

### 5.1.4 POWER DENSITY

RESULT: *Passed*

### 5.1.5 CONDUCTED SPURIOUS EMISSIONS AND FREQUENCY BAND EDGE MEASURED IN 100KHZ BANDWIDTH

RESULT: *Passed*

### 5.1.6 SPURIOUS EMISSION

RESULT: *Passed*

### 5.2.1 MAINS CONDUCTED EMISSIONS

RESULT: *Passed*

### 6.1.1 ELECTROMAGNETIC FIELDS

RESULT: *Passed*

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## 1. General Remarks

### 1.1 Complementary Materials

The following attachments are integral parts of this test report:

**Appendix P: Photo Documentation internal view**  
(File Name: 60359686 001 Appendix P)

**Appendix D: Test Result of Radiated Emissions**  
(File Name: 60359686 001 Appendix D)

**Appendix X: Photographs of the Test Set-Up**  
(File Name: 60359686 001 Appendix X)

### Test Specifications

**Table 1: Applied Standard and Test Levels**

<b>Radio</b>
FCC 47CFR Part 15: Subpart C Section 15.247 FCC 47CFR Part 2: Subpart J Section 2.1093 ISED RSS-247 Issue 2, March 2017 ISED RSS-102 Issue 5, March 2015 ISED RSS-Gen, Issue 5, March 2019 ANSI C63.10:2013 KDB558074 D01 DTS Meas Guidance v05r02 KDB447498 D01 General RF Exposure Guidance v06

### 1.2 Decision Rule of conformity

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.

## 2. Test Sites

### 2.1 Test Laboratory

Taipei Testing laboratories

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.  
Taipei City 105  
Taiwan (R.O.C.)

### 2.2 Test Facility

Taipei Testing laboratories

AC Mains Conduction:  
11F. No.758, Sec. 4, Bade Rd., Songshan Dist.  
Taipei City 105  
Taiwan (R.O.C.)  
FCC Registration No.: 180491  
IC Canada Registration No.: 9465A

Conducted Test / Radiated Test:  
No. 458-18, Sec 2, Fenliao., Linkou Dist.  
New Taipei City 244  
Taiwan (R.O.C.)  
FCC Registration No.: 226631  
IC Canada Registration No.: 25563

TAF Accredited NCC Test Lab. No.:3567  
TAF ISO17025 Certification effective period: 6<sup>th</sup>-May-2019 to 05<sup>th</sup>-May-2022



Testing Laboratory  
**3567**

## 2.3 List of Test and Measurement Instruments

**Table 2: List of Test and Measurement Equipment**
**Radiated Test Equipment(Testing date from 2020/01/08 to 2020/05/01):**

Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	R&S	ESR7	102109	2019/4/17 2020/3/30	2020/4/15 2021/3/29
Spectrum Analyzer	R&S	FSV40	101112	2019/10/15	2020/10/15
LF-AMP	Agilent	8447D	2727A05146	2019/2/22 2020/2/17	2020/2/21 2021/2/15
HF-AMP + AC source	EMCI	EMC051845SE	980635	2019/2/23 2020/2/11	2019/2/22 2021/2/9
HF-AMP + AC source	EMCI	EMC184045SE	980656	2019/2/23 2020/2/11	2019/2/22 2021/2/9
Bilog Antenna	SCHWARZBECK	VULB-9168	00950	2019/1/14 2020/1/20	2020/1/13 2021/1/18
Horn Antenna	ETS-Lindgren	3117	00218929	2019/11/27	2020/11/25
Horn Antenna	SCHWARZBECK	BBHA 9170	00890	2019/04/12 2020/3/25	2020/04/11 2021/3/24
Loop Antenna	EMCI	LPA600	287	2019/12/20	2020/12/19
Test Software	Audix	e3	Ver. 9	N/A	N/A
Test Cable	HUBER+SUHNER	SUCOFLEX 104EA_9k~18G	800056/4EA	2019/4/18	2020/5/1
Test Cable	HUBER+SUHNER	SUCOFLEX 104_9k~18G	804680/4	2019/4/18	2020/5/1
Test Cable	HUBER+SUHNER	SUCOFLEX 104_9k~18G	MY37202/4	2019/4/18	2020/5/1
Test Cable	HUBER+SUHNER	SUCOFLEX 102EA_1G~40G	800898/2EA	2019/4/18	2020/5/1
Test Cable	HUBER+SUHNER	SUCOFLEX 102EA_1G~40G	800901/2EA	2019/4/18	2020/5/1
Test Cable	HUBER+SUHNER	SUCOFLEX 102EA_1G~40G	801027/2EA	2019/4/18	2020/5/1

**Conducted Test Equipment(Testing date from 2020/02/27 to 2020/03/31):**

Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	R&S	FSV40	101512	2020/2/18	2021/2/16
Power Meter	Anritsu	ML2495A	1901008	2019/4/29	2020/4/28
Power Sensor	Anritsu	MA2411B	1725269	2019/4/29	2020/4/28
Spectrum Analyzer	R&S	FSV40	101512	2020/2/18	2021/2/16

**Conduction Test Equipment(Testing data is 2020/04/07):**

Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
TWO-LINE V-NETWORK	SCHHWARZBECK	NSLK 8127	8127-00976	2019/10/2	2020/9/30
EMI Test Receiver	R&S	ESR7	102108	2020/3/16	2021/3/15
10dB attenuation	SCHHWARZBECK	VTSD 9561 F-N	660	2020/2/24	2021/2/23
Measurement Software	EZ	EZ_EMG (Version NB-03A)	N/A	N/A	N/A

## 2.4 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

## 2.5 Calibration

Equipment requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular schedule using in house standards or comparisons.

## 2.6 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements .

**Table 3: Emission Measurement Uncertainty**

Parameter	Uncertainty
Radio Frequency	± 0.1 ppm
RF power/RF Exposure(MPE), conducted	± 1.5 dB
RF power density, conducted	± 3 dB
spurious emissions, conducted	± 3 dB
all emissions, radiated	± 6 dB
Temperature	± 1 °C
Humidity	± 5 %
DC and low frequency voltages	±3 %



## 3. General Product Information

### 3.1 Product Function and Intended Use

The EUT is a 2.4GHz Wi-Fi® Module with IEEE® 802.11 b/g/n. It contains the Wireless MCU SoC, an integrated RF Front-end Module (FEM) enabling the user to communicate data through a Wireless interface.

The module variants integrate Trust&GO option and the following antenna options:

- PCB antenna (WFI32E01PC/ WFI32E01PE)
- u.FL Connector for external antenna (WFI32E01UC, WFI32E01UE)

The Trust&GO is a pre-configured and pre-provisioned secure element of Microchip's family of security focused devices.

For details refer to the User Guide, Data Sheet and Circuit Diagram.

### 3.2 System Details and Ratings

**Table 4: Basic Information of EUT**

Item	EUT information
Kind of Equipment/Test Item	2.4GHz Wi-Fi® Module
Type Identification	WFI32E01PE, WFI32E01UE, WFI32E01PC, WFI32E01UC
FCC ID	2ADHKWFI32E01
IC ID	20266-WFI32E01
HVIN	WFI32E01PE, WFI32E01UE, WFI32E01PC, WFI32E01UC

**Table 5: Technical Specification of EUT**

Technical Specification	Value
Operating Frequencies	802.11b/g/n20 : 2412MHz ~ 2462MHz
Channel Spacing	5 MHz
Channel number	802.11b/g/n: 11 (2412 MHz ~ 2462 MHz)
Operation Voltage	3.0V DC to 3.6V DC; 3.3V typical (Tested at 3.3V DC)
Modulation	802.11b: DSSS 802.11g/n: OFDM with BPSK, QPSK, QAM
Antenna gain	Refer to Table6
Product Type	802.11b: WLAN 802.11g: WLAN 802.11n: WLAN

**Table 6: Antenna List**

Antenna #1 selected for RSE measurements and EMC testing for WFI32E01UC and WFI32E01UE.  
 Antenna #10 selected for RSE measurements and EMC testing for WFI32E01PC and WFI32E01PE.

S/no.	P/N	Vendor	Antenna Gain @ 2.4GHz Band	Antenna type	Cable length/ Remarks
1	RFA-02-L2H1	Alead/ Aristotle	2 dBi	Dipole	150mm
2	RFA-02-C2H1-D034	Alead/ Aristotle	2 dBi	Dipole	150mm
3	RFA-02-D3	Alead/ Aristotle	2dBi	Dipole	150mm
4	RFDPA870920IMLB301	WALSIN	1.84 dBi	Dipole	200mm
5	RFDPA870920IMAB302	WALSIN	1.82 dBi	Dipole	200mm/ Black
6	RFDPA870920IMAB305	WALSIN	1.82 dBi	Dipole	200mm/ Grey
7	RFDPA870910IMAB308	WALSIN	2 dBi	Dipole	100mm
8	RFA-02-C2M2	Alead/ Aristotle	2 dBi	Dipole	RP-SMA to u.FL cable length of 100mm (Refer note 1 and 2)
9	RN-SMA-S-RP	Microchip	0.56 dBi	Dipole	RP-SMA to u.FL cable length of 100mm. (Refer note 1 and 2)
10	-	Microchip	2.51 dBi	PCB (Inverted F)	-

**Note:**

- 1) If the end-product using the Module is designed to have an antenna port that is accessible to the end-user than a unique (non-standard) antenna connector (as permissible by FCC) must be used (e.g. RP (Reverse Polarity)-SMA socket). If an RF coaxial cable is used between the module RF output and the enclosure, than a unique antenna connector must be used in the enclosure wall for interface with antenna.
- 2) If an RF coaxial cable is used between the module RF output and the enclosure, than a unique (non-standard) antenna connector must be used in the enclosure wall for interface with antenna.

### **3.3 Independent Operation Modes**

Basic operation modes are:

- A. Transmitting
- B. Receiving

### **3.4 Noise Generating and Noise Suppressing Parts**

Refer to the Circuit Diagram.

### **3.5 Submitted Documents**

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description

## 4. Test Set-up and Operation Modes

### 4.1 Principle of Configuration Selection

The test modes were adapted accordingly in reference to the instructions for use.

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

The worst sample identified as primary model for testing is 'with Trust&GO' component. Radiated spot check were conducted for other Test samples - 'without Trust&GO' and samples with Alternate Components.

Model No.	Description
WFI32E01PC	Module with PCB Antenna and Trust&GO
WFI32E01PE	Module with PCB Antenna
WFI32E01UC	Module with u.FL Connector for External Antenna and Trust&GO
WFI32E01UE	Module with u.FL Connector for External Antenna

## 4.2 Test Operation and Test Software

Setup for testing: Test samples are provided with a USB/UART interface which makes it possible to control them through a test software installed on a notebook computer.

This software as PC command tool (Version 0.93) was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed in section 3.3 as appropriate

**Table 7: Table for Parameters of Test Software Setting**

Mode/ Data Rate	Channel Frequency / Power Setting		
	2412 MHz	2437 MHz	2462 MHz
802.11b	62	72	66
802.11g	72	87	74
802.11n	68	87	71

### Test Sample Configuration:

Reference No.	Model No.	Module Description	Sample No.	Remark
#6	WFI32E01PC	PCB Antenna and Trust&GO	A001058666-041	Radiated Test
#5	WFI32E01UC	u.FL Connector for External Antenna and Trust&GO	A001058666-049	Radiated Test (Sample #1)
#12	WFI32E01UC	u.FL Connector for External Antenna and Trust&GO	A001058666-046	Conducted Test

### Radiated Spot check: Samples without Trust&GO:

Reference No.	Model No.	Module Description	Sample No.	Remark
#64	WFI32E01PE	PCB Antenna	A001058666-022	Radiated Test
#61	WFI32E01UE	u.FL Connector for External Antenna	A001058666-036	Radiated Test

### Radiated Spot check: Samples with Alternate Components:

Reference No.	Model No.	Module Description	Sample No.	Remark
#221	WFI32E01PC	PCB Antenna and Trust&GO	A001064026-023	Radiated Test
#238	WFI32E01PE	PCB Antenna	A001064026-005	Radiated Test
#207	WFI32E01UC	u.FL Connector for External Antenna and Trust&GO	A001064026-003	Radiated Test
#240	WFI32E01UE	u.FL Connector for External Antenna	A001064026-006	Radiated Test
#214	WFI32E01UC	u.FL Connector for External Antenna and Trust&GO	A002816653-004	Radiated Test (Sample #2)

Full test was applied on all test modes, but only worst case was shown.

### 4.3 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

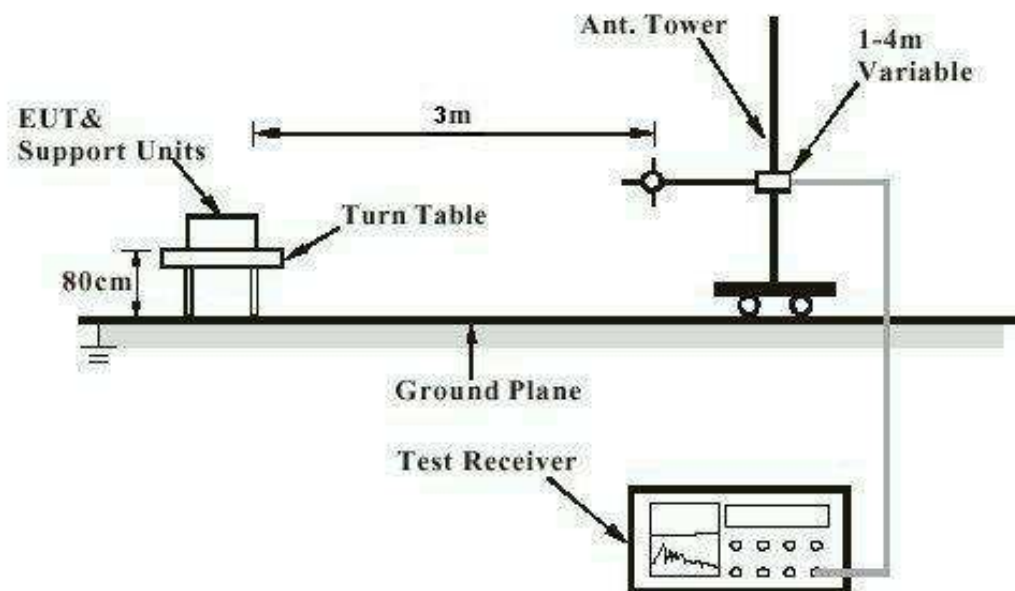
Kind of Equipment	Manufacturer	Model No.	Serial No.
Notebook(EMC-06)	Lenovo	TP00048A	PB-0F8B2

### 4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

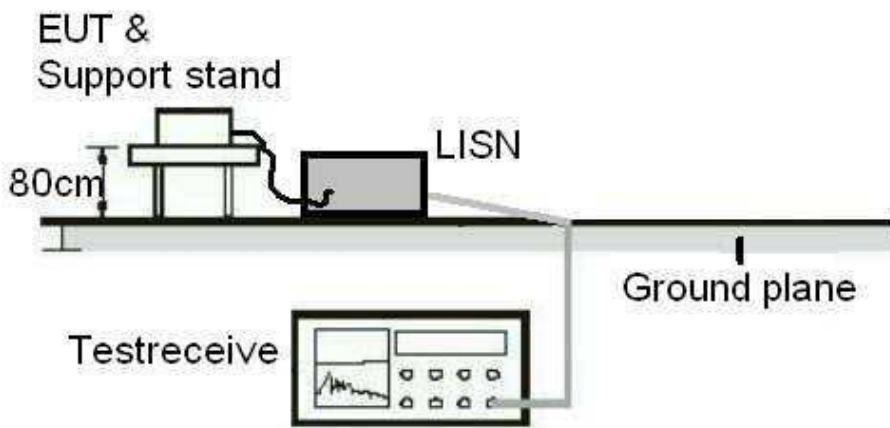
### 4.5 Test Setup Diagram

**Diagram of Measurement Configuration for Radiation Test**

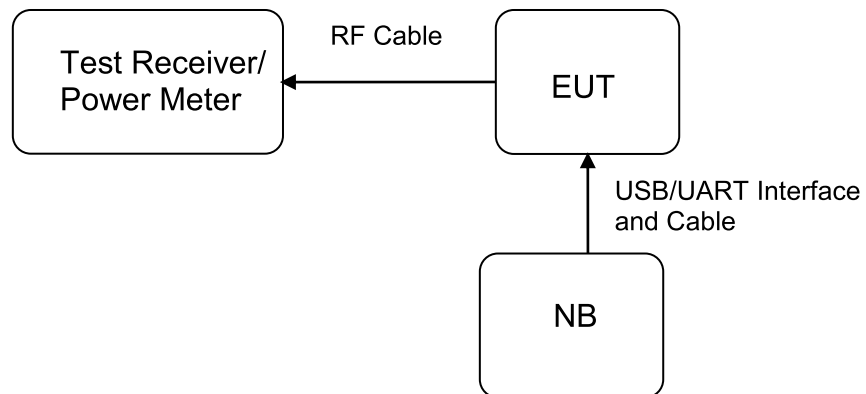


Note: Measurements above 1 GHz are done with a table height of 1.5m

**Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)**



**Diagram of Measurement Equipment Configuration for Conducted Transmitter Measurement**



## 5. Test Results

### 5.1 Transmitter Requirement & Test Suites

#### 5.1.1 Antenna Requirement

**RESULT:** **Passed**

Test standard : FCC Part 15.247(b)(4), Part 15.203 and ISSED  
RSS-Gen 6.8

Requirement : use of approved antennas only with directional gains that  
do not exceed 6 dBi

According to the manufacturer declaration, the EUT (WFI32E01PC/ WFI32E01PE) has an antenna with a directional gain of 2.51dBi.

The antenna is a printed trace with no possibility of replacement with a non-approved antenna by the end-user.

The EUT (WFI32E01UC, WFI32E01UE) has an antenna with Max directional gain of 2dBi (refer External Antenna List).The antenna is connected through a proprietary connector with no possibility of replacement with a non-approved antenna by the end-user.

Therefore, the EUT is considered to comply with this provision.

Refer to EUT photo for details.



### 5.1.2 Peak Output Power

**RESULT:**
**Passed**

Test standard : FCC Part 15.247(b)(3), ISED RSS-Gen 5.4(d)  
 Basic standard : ANSI C63.10:2013, KDB558074  
 Limit : 1 Watt  
 Kind of test site : Shielded room

**Test setup**

Test Channel : Low/ Middle/ High  
 Operation Mode : A  
  
 Ambient temperature : 20-24 °C  
 Relative humidity : 50-65 %  
 Atmospheric pressure : 100-103 kPa

**Table 8: Test result of Output Power**

Mode	Channel Frequency	Peak Output Power (Peak)	Total Peak Output Power	Output Power (Average) Reference	Limit
	(MHz)	(dBm)	(mW)	(dBm)	(W)
802.11b	2412	22.95	197.24	20.32	1
	2437	23.92	246.60	21.94	1
	2462	23.00	199.53	20.18	1
802.11g	2412	24.96	313.33	17.20	1
	2437	25.19	330.37	20.04	1
	2462	24.57	286.42	16.48	1
802.11n HT20	2412	24.42	276.69	15.97	1
	2437	25.10	323.59	20.02	1
	2462	24.33	271.02	15.73	1
Max EIRP	-	27.70	-	-	-

### 5.1.3 6dB Bandwidth and 99% Bandwidth

**RESULT:****Passed**

Test standard : FCC Part 15.247(a)(2), ISED RSS-247 5.2(a)  
Basic standard : ANSI C63.10:2013, KDB558074  
Kind of test site : Shielded room

**Test setup**

Test Channel : Low/ Middle/ High  
Operation Mode : A  
  
Ambient temperature : 20-24°C  
Relative humidity : 50-65%  
Atmospheric pressure : 100-103 kPa

**Table 9: Test result of 6dB Bandwidth**

Mode	Channel Frequency	6dB Bandwidth	Limit	Result
	(MHz)	(MHz)	(dBm)	Pass/Fail
802.11b	2412	9.071	>500	Pass
	2437	9.071	>500	Pass
	2462	8.991	>500	Pass
802.11g	2412	16.264	>500	Pass
	2437	16.344	>500	Pass
	2462	16.264	>500	Pass
802.11n HT20	2412	17.303	>500	Pass
	2437	16.943	>500	Pass
	2462	17.143	>500	Pass

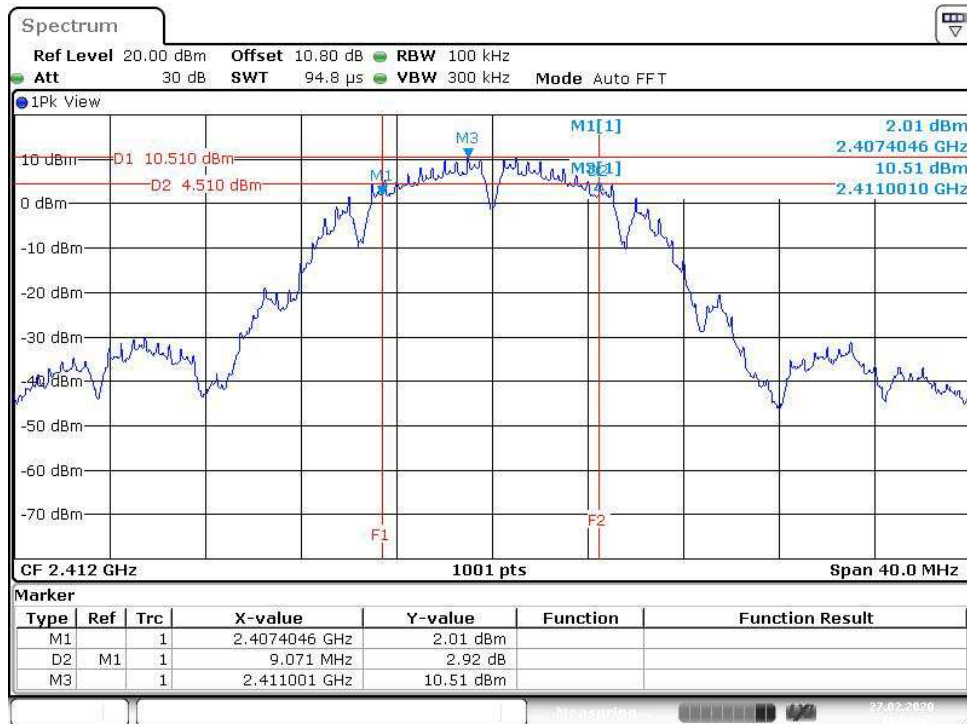
**Table 10: Test result of 99% Bandwidth**

Mode	Channel Frequency	99% Bandwidth
	(MHz)	(MHz)
802.11b	2412	13.306
	2437	13.546
	2462	13.306
802.11g	2412	16.663
	2437	17.262
	2462	16.743
802.11n HT20	2412	17.742
	2437	18.061
	2462	17.742

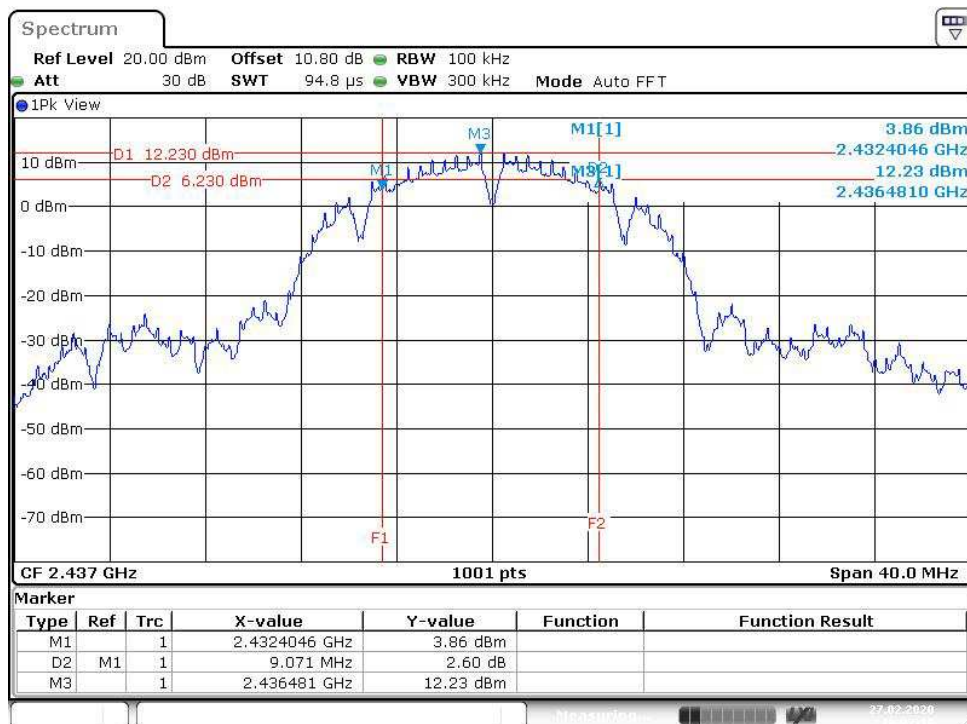
## Test Plot of 6dB Bandwidth

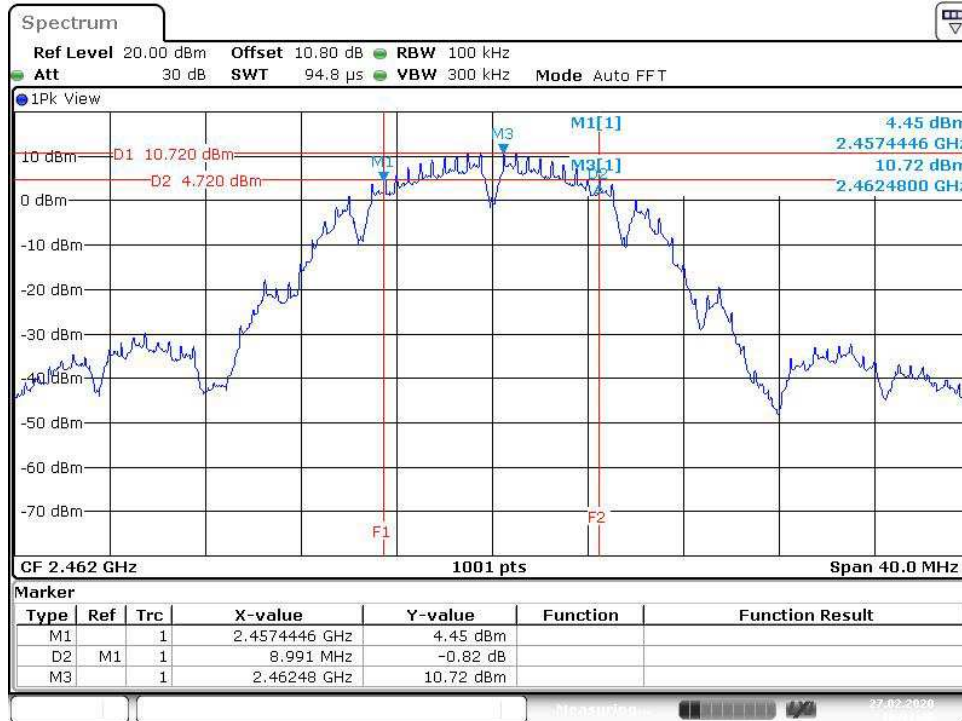
### 802.11b

#### Low Channel

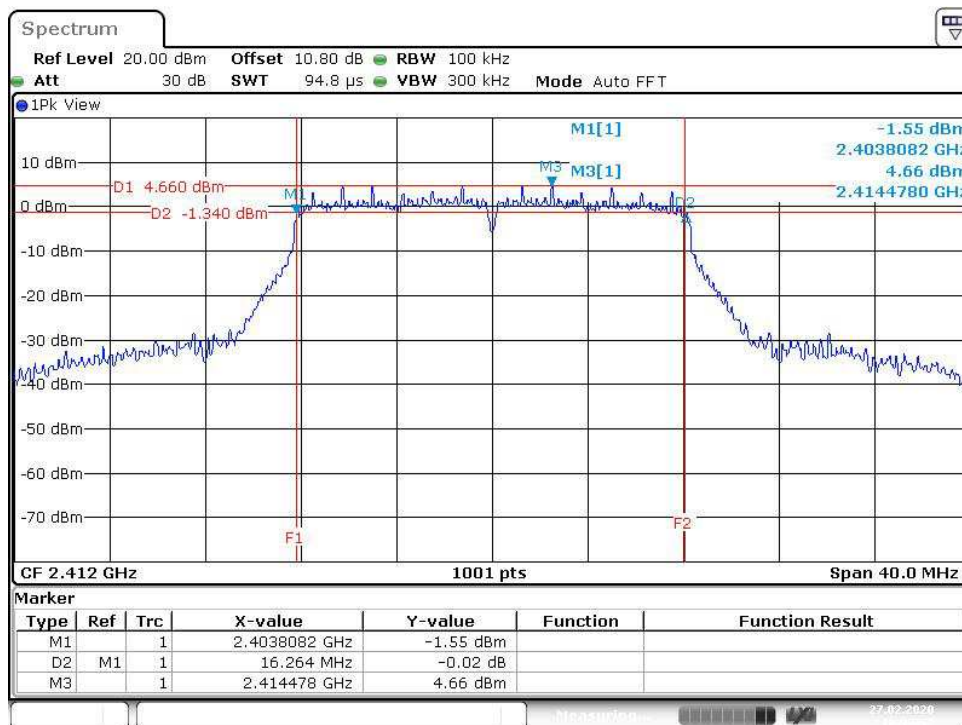


#### Middle Channel

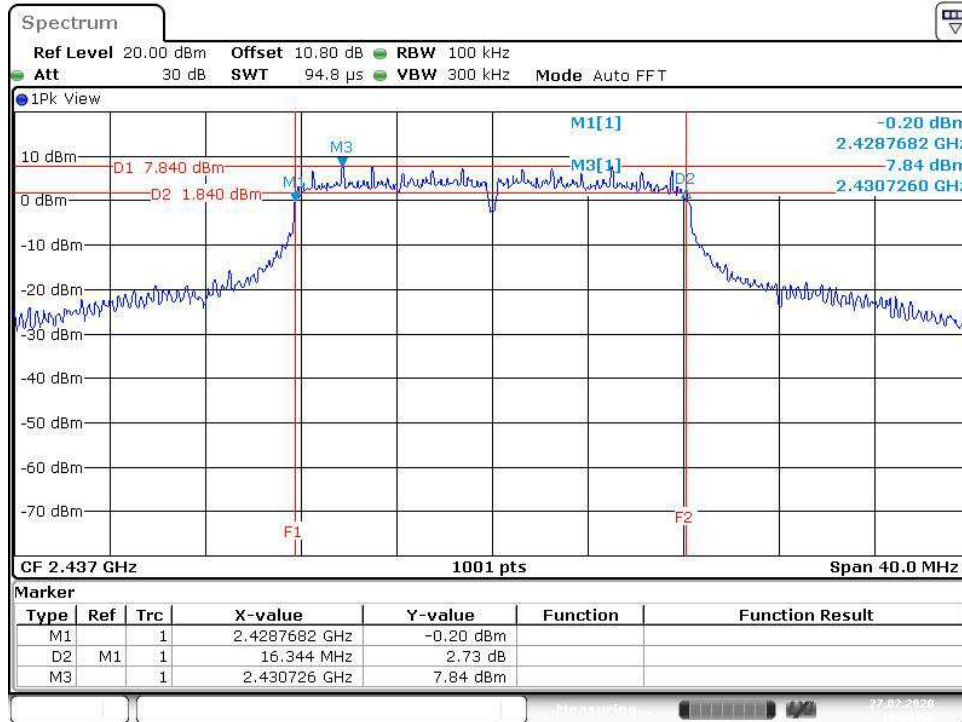


**High Channel**


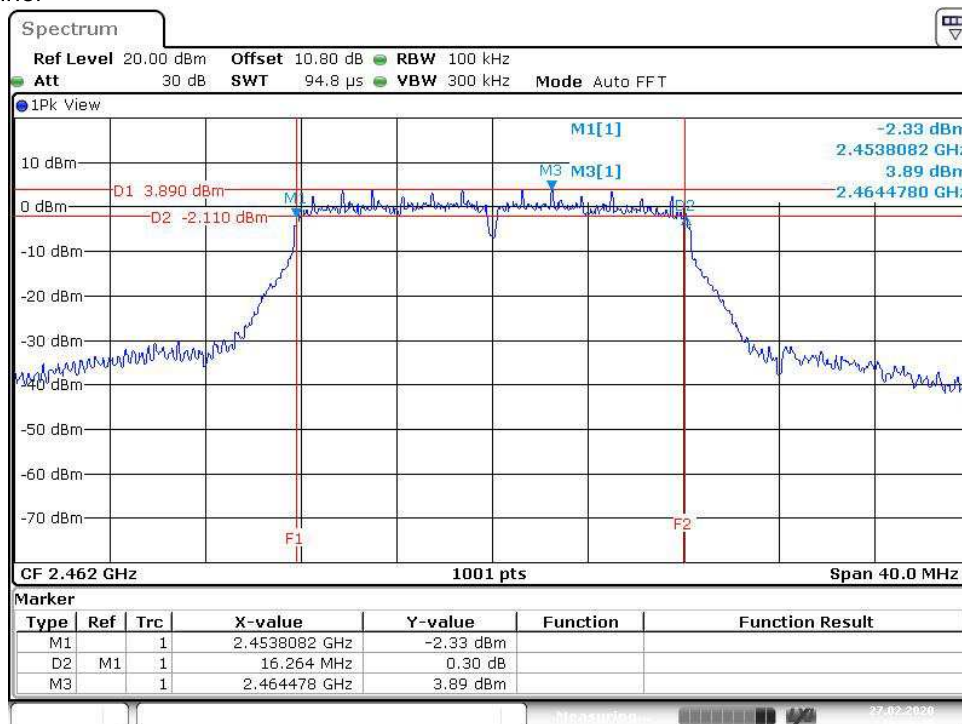
Date: 27.FEB.2020 16:31:41

**802.11g**
**Low Channel**


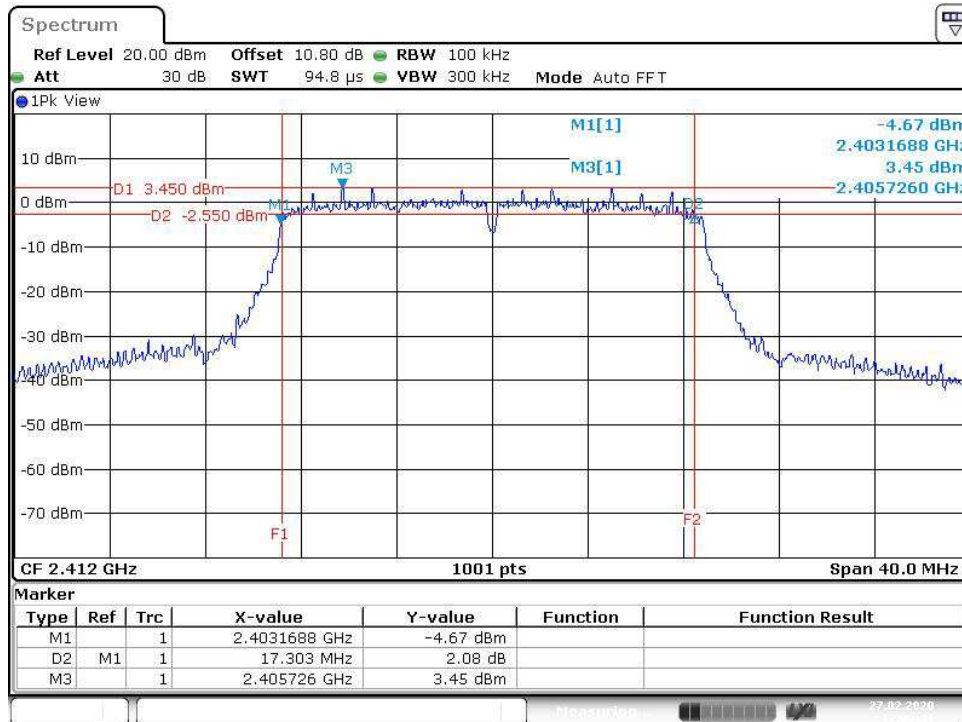
Date: 27.FEB.2020 16:35:52

**Middle Channel**


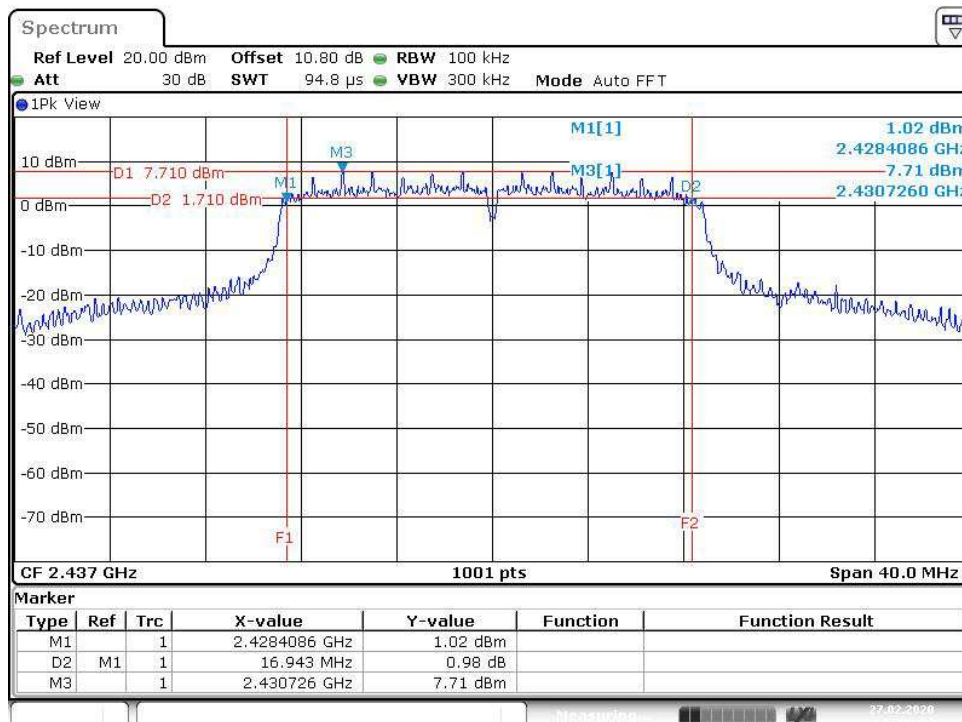
Date: 27.FEB.2020 16:41:56

**High Channel**


Date: 27.FEB.2020 16:46:47

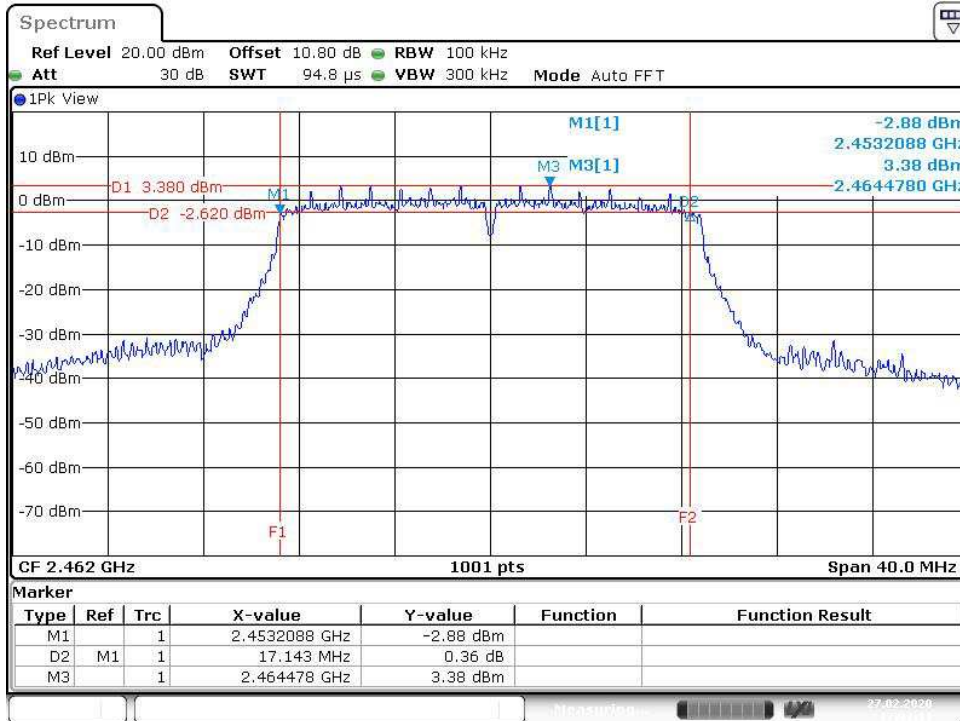
**802.11n HT20**
**Low Channel**


Date: 27.FEB.2020 17:03:31

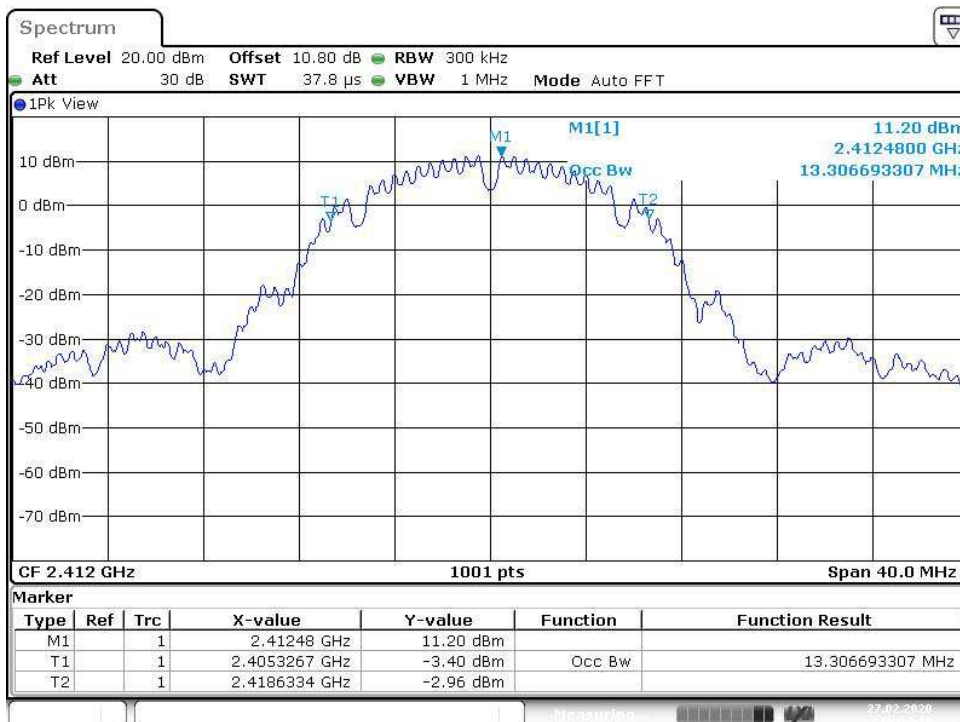
**Middle Channel**


Date: 27.FEB.2020 17:09:04



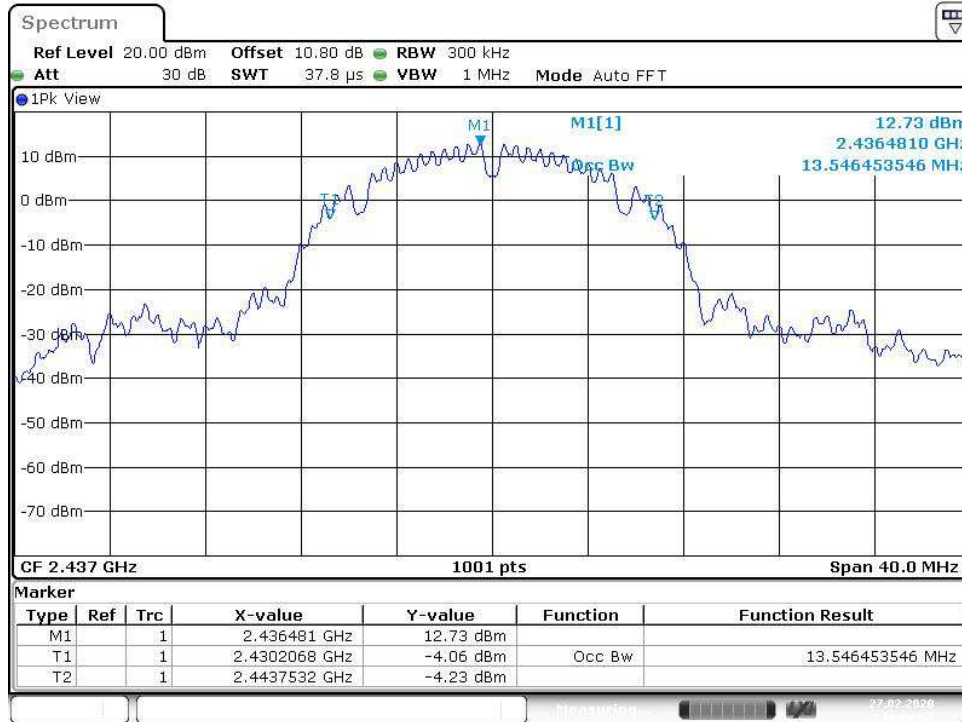
**High Channel**


Date: 27.FEB.2020 17:31:11

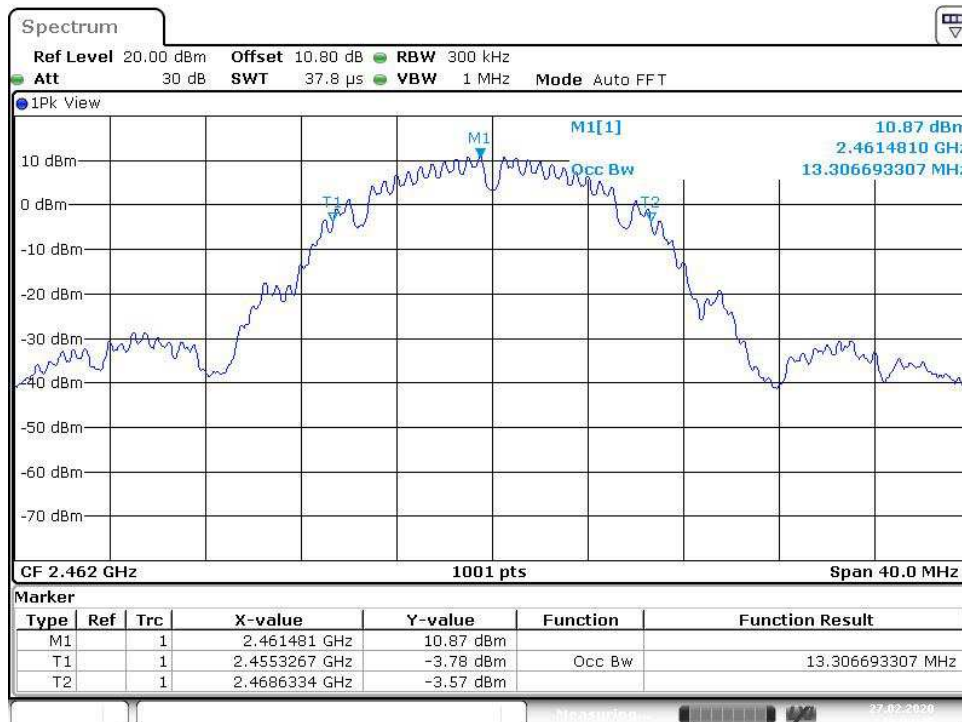
**Test Plot of 99% Bandwidth**
**802.11b**
**Low Channel**


Date: 27.FEB.2020 16:24:16

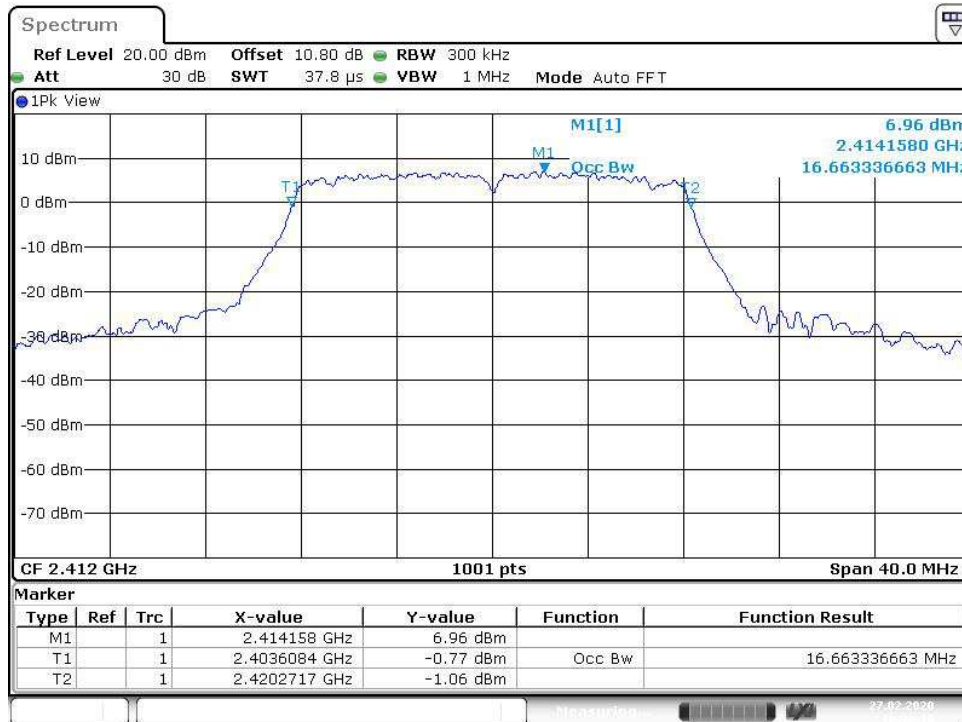


**Middle Channel**


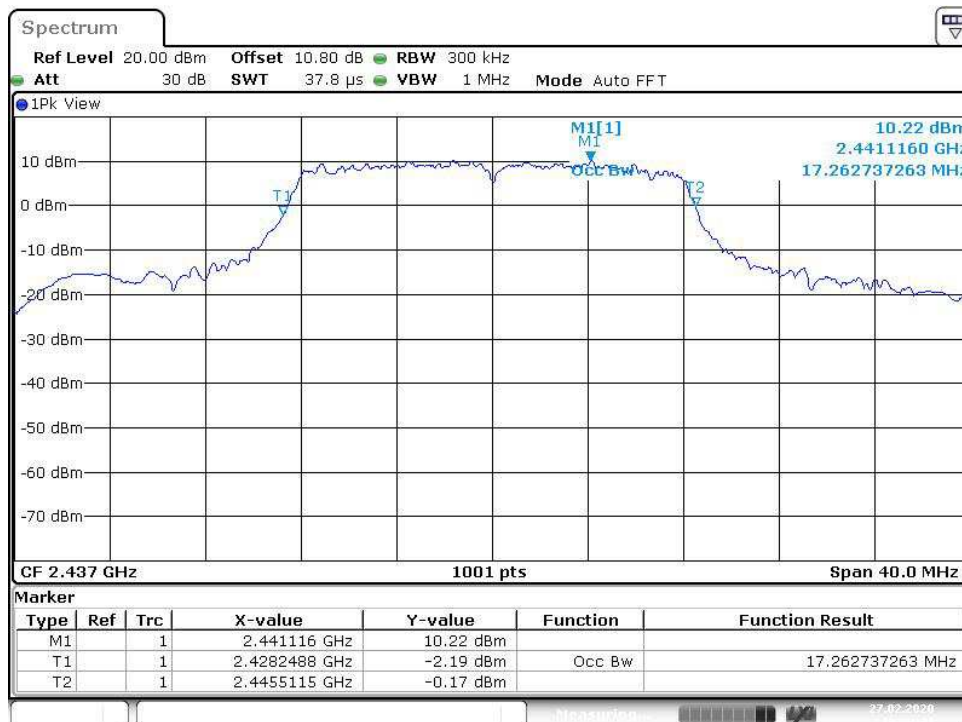
Date: 27.FEB.2020 16:28:53

**High Channel**


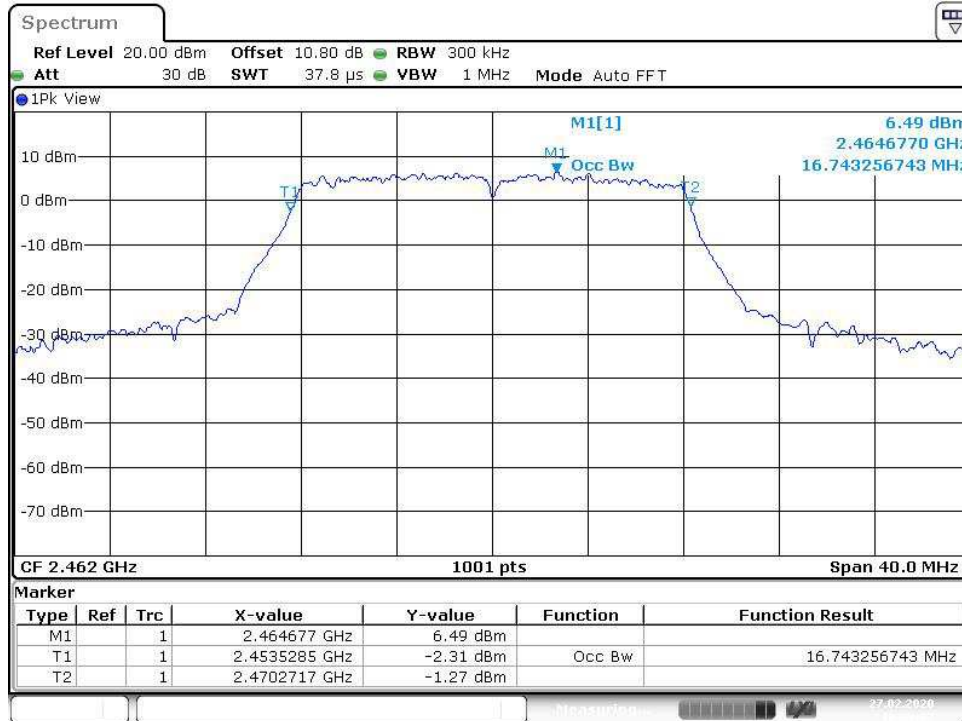
Date: 27.FEB.2020 16:32:20

**802.11g**
**Low Channel**


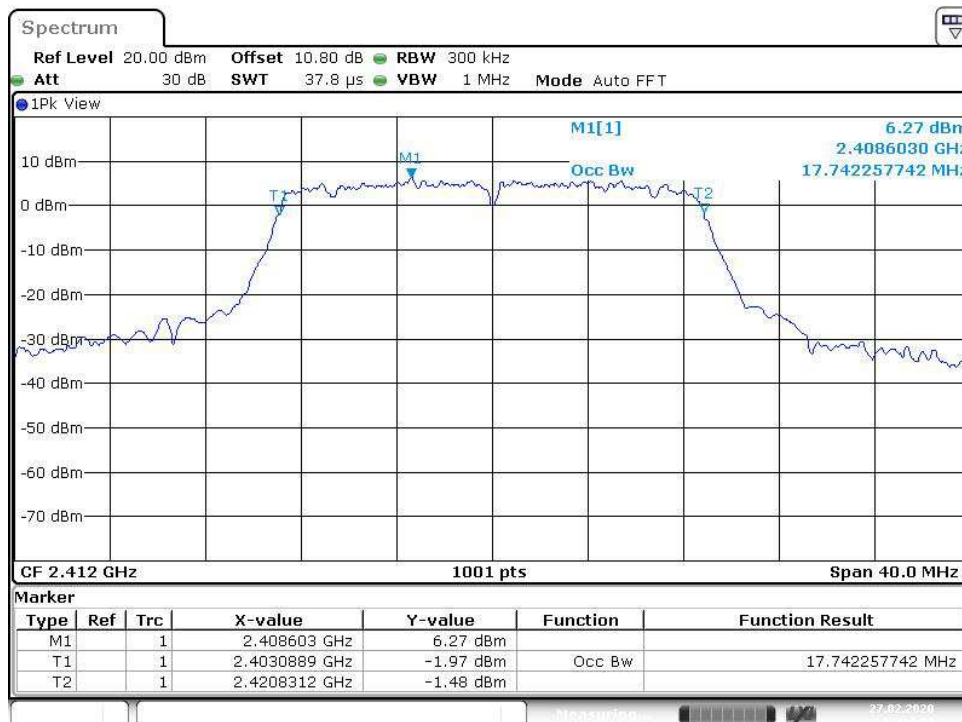
Date: 27.FEB.2020 16:36:19

**Middle Channel**


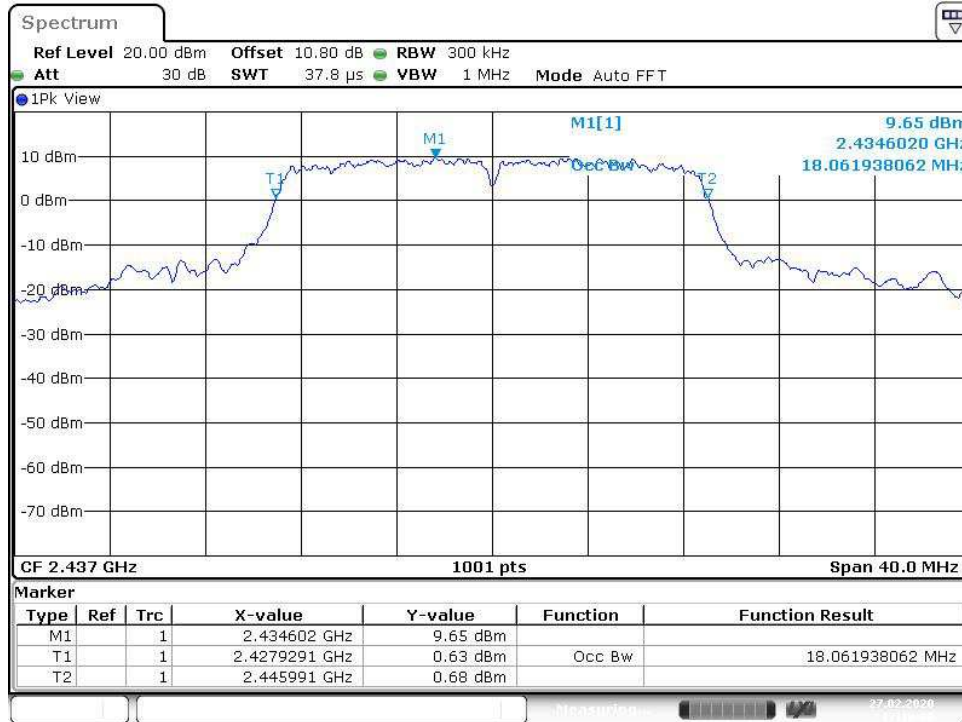
Date: 27.FEB.2020 16:42:22

**High Channel**


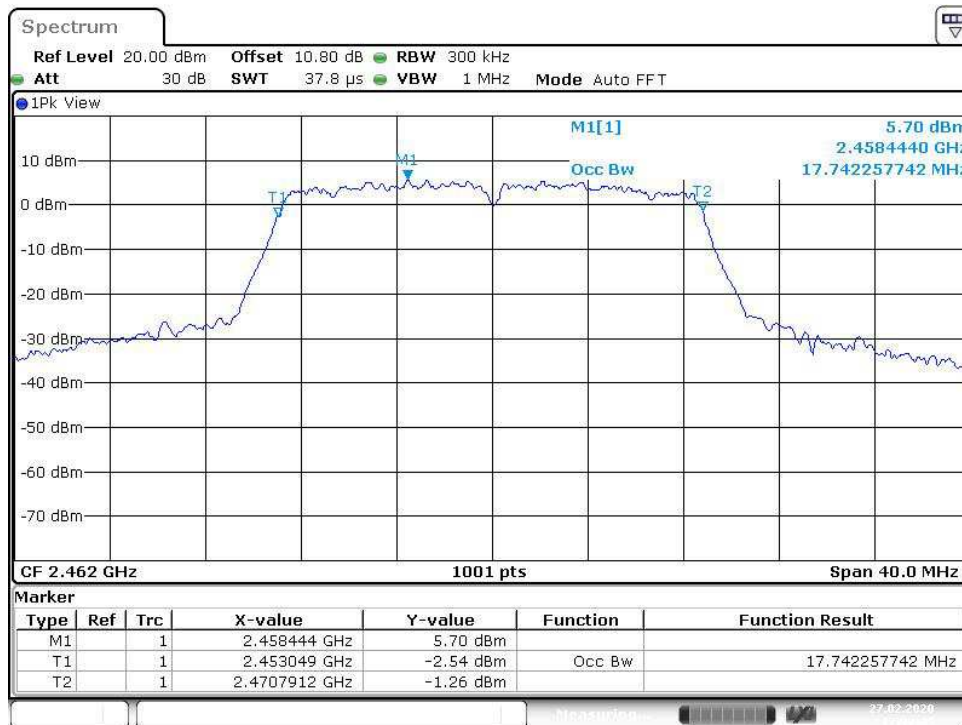
Date: 27.FEB.2020 16:49:08

**802.11n HT20**
**Low Channel**


Date: 27.FEB.2020 17:04:01

**Middle Channel**


Date: 27.FEB.2020 17:10:06

**High Channel**


Date: 27.FEB.2020 17:32:45

### 5.1.4 Power Density

**RESULT:**
**Passed**

Test standard : FCC Part 15.247(e), ISED RSS-247 5.2(b)  
 Basic standard : ANSI C63.10:2013, KDB558074  
 Kind of test site : Shielded room

**Test setup**

Test Channel : Low/ Middle/ High  
 Operation Mode : A  
 Ambient temperature : 20-24°C  
 Relative humidity : 50-65%  
 Atmospheric pressure : 100-103 kPa

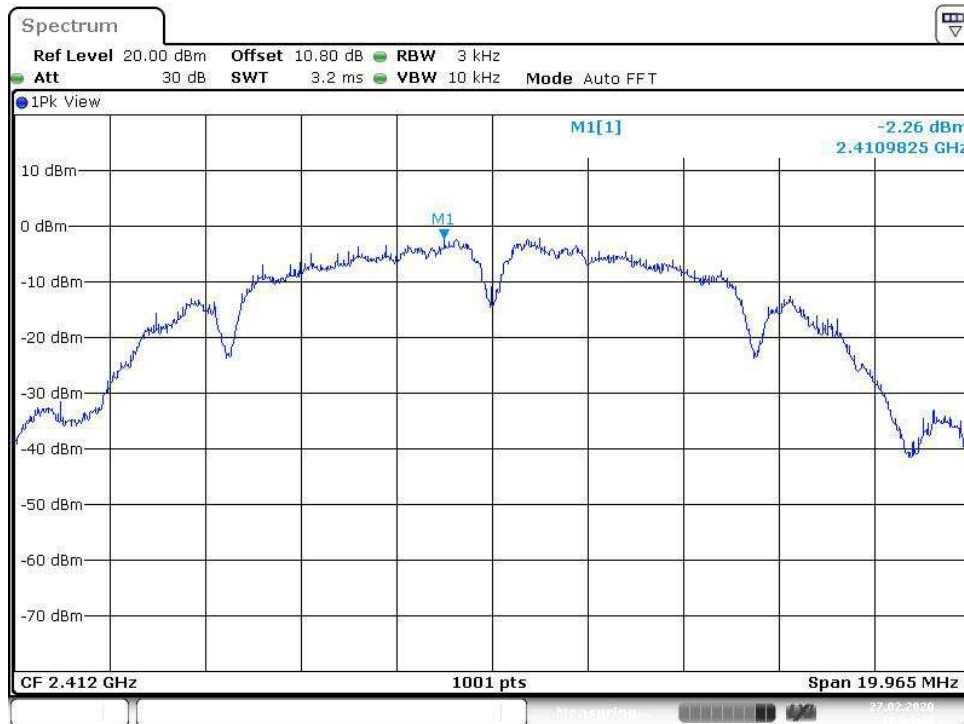
**Table 11: Test result of Power Density**

Mode	Channel Frequency	Power Density	Limit	Result
	(MHz)	(dBm/3kHz)	(dBm/3kHz)	Pass/Fail
802.11b	2412	-2.26	8	Pass
	2437	0.49	8	Pass
	2462	-1.65	8	Pass
802.11g	2412	-8.19	8	Pass
	2437	-5.85	8	Pass
	2462	-8.93	8	Pass
802.11n HT20	2412	-8.97	8	Pass
	2437	-5.29	8	Pass
	2462	-9.55	8	Pass

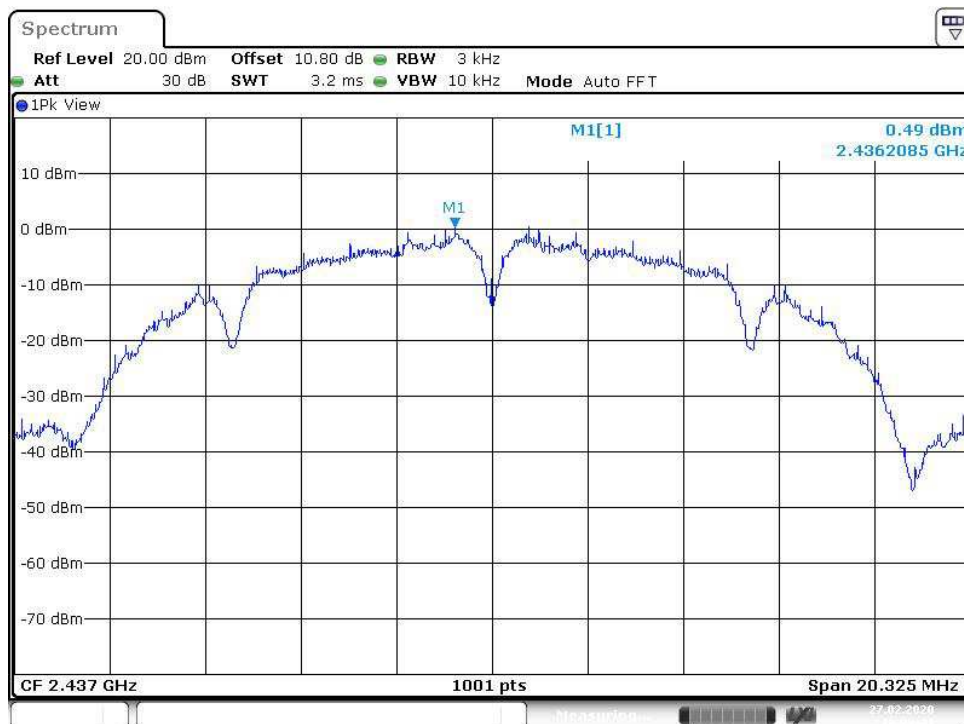
## Test Plot of Power Density

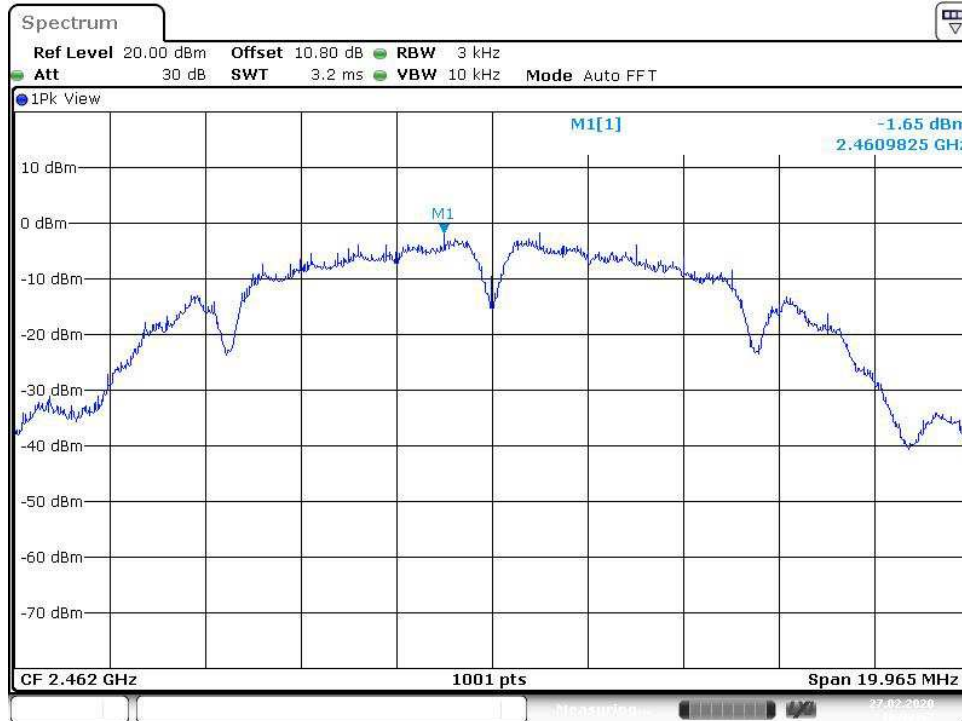
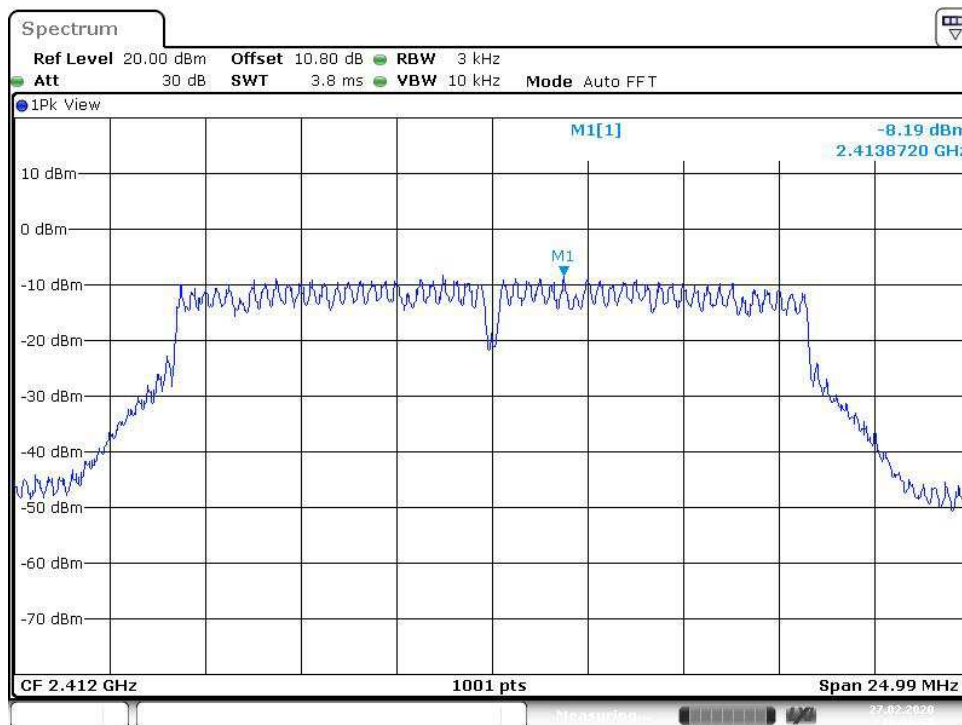
### 802.11b

#### Low Channel

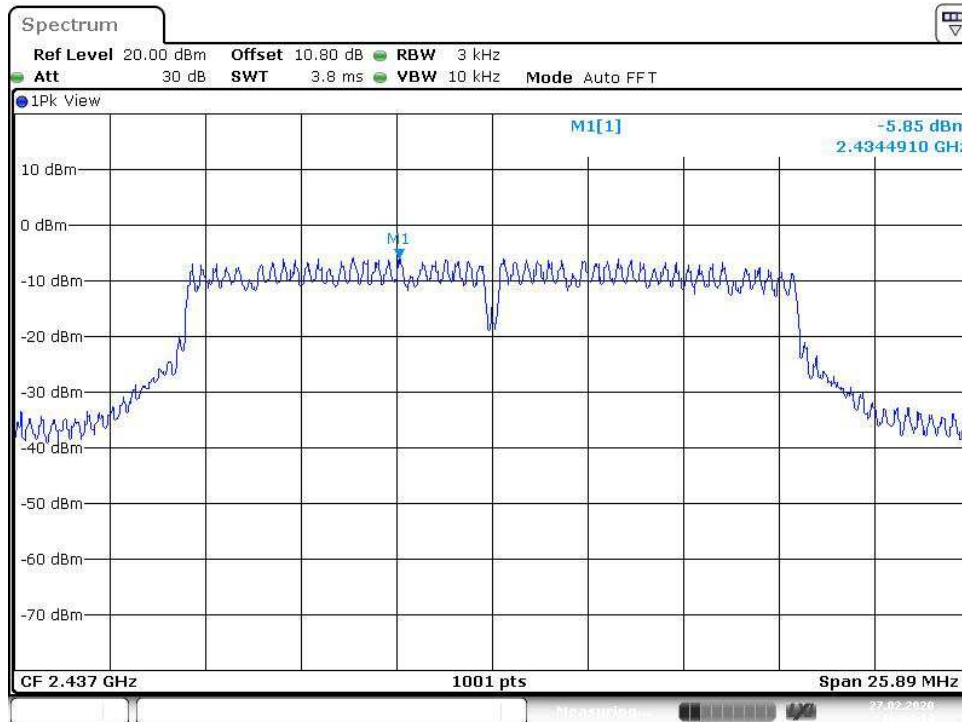


#### Middle Channel

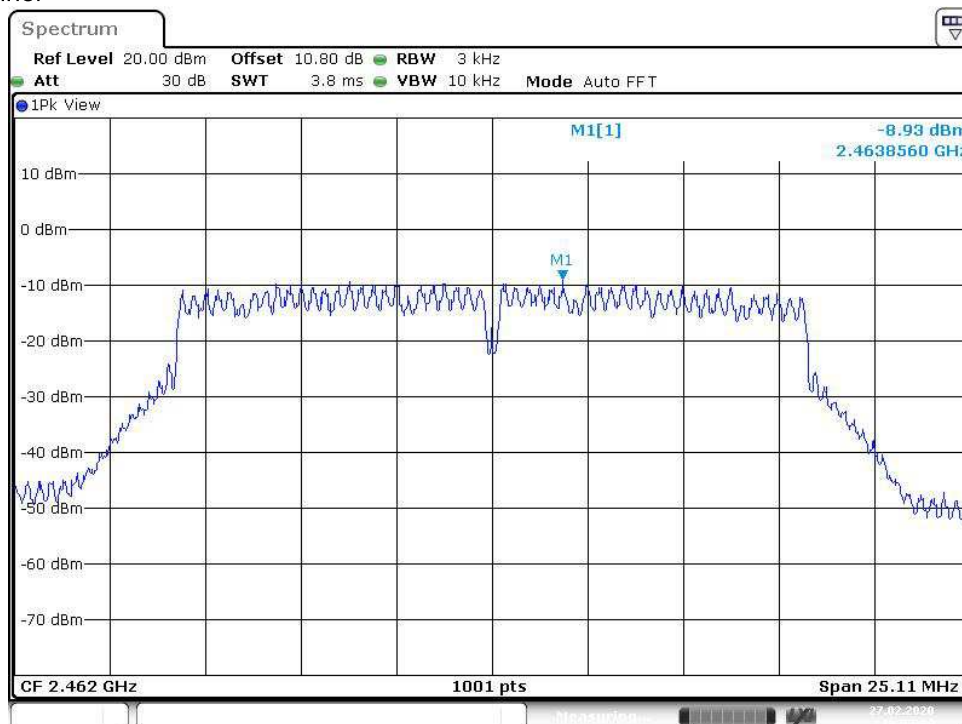


**High Channel**

**802.11g**
**Low Channel**




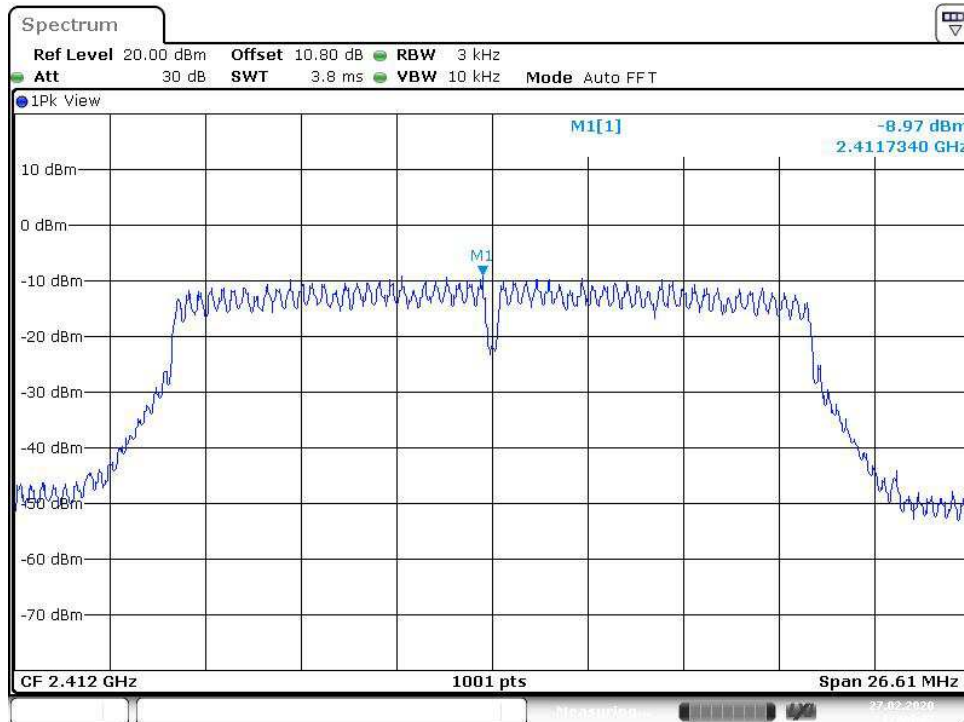
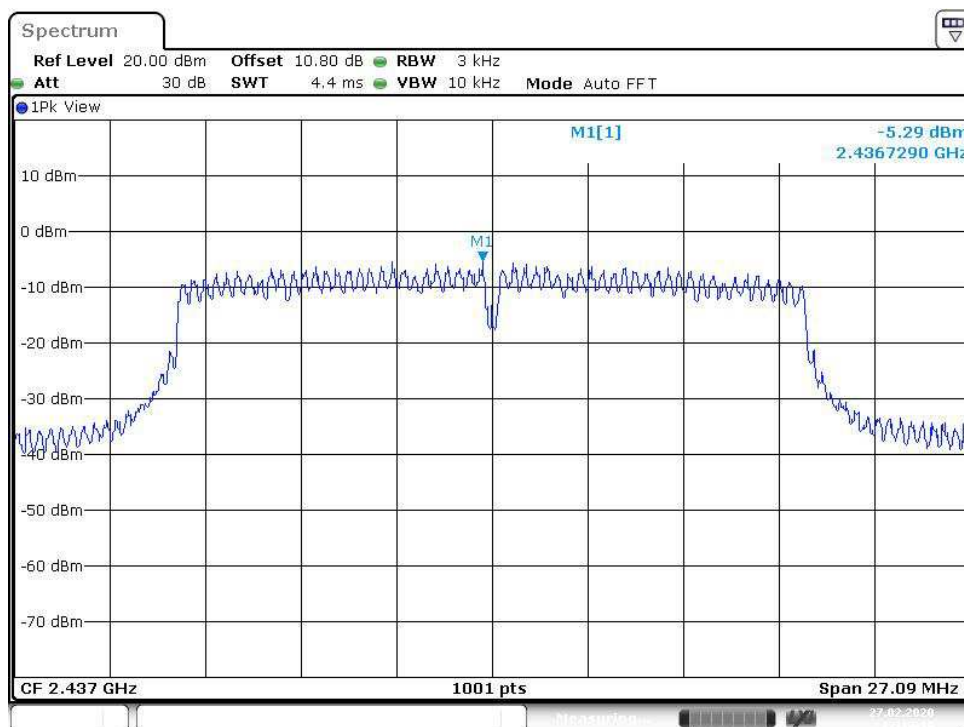
**Middle Channel**


Date: 27.FEB.2020 16:44:15

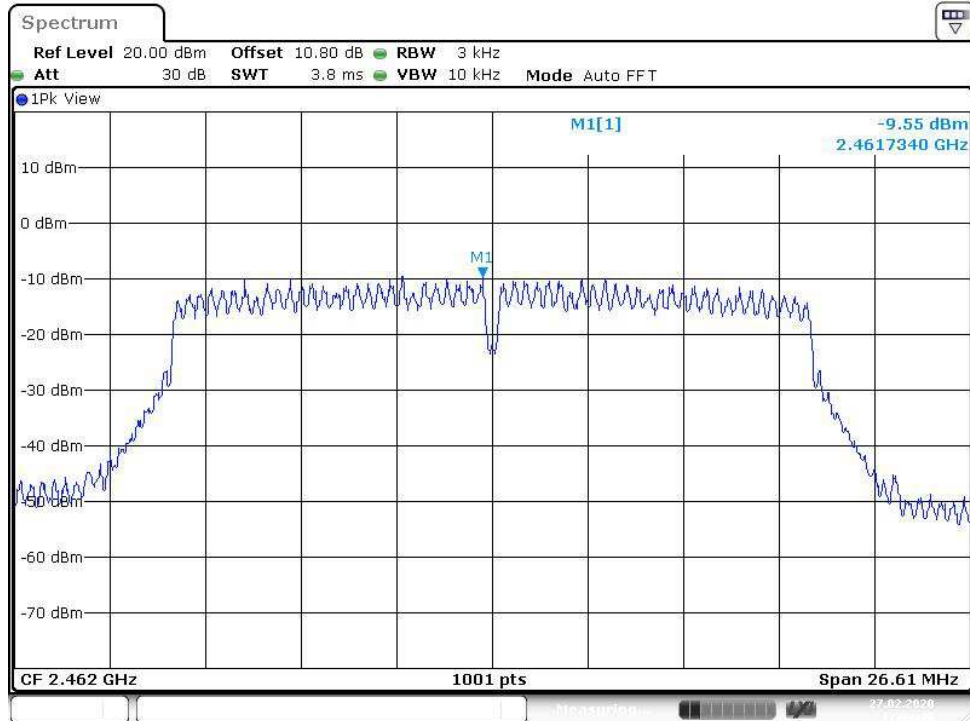
**High Channel**


Date: 27.FEB.2020 16:55:04



**802.11n HT20**
**Low Channel**

**Middle Channel**


High Channel



Date: 27.FEB.2020 17:33:39

### 5.1.5 Conducted spurious emissions and Frequency Band Edge measured in 100kHz Bandwidth

**RESULT:****Passed**

Test standard : FCC part 15.247(d), ISED RSS-247 5.5  
Basic standard : ANSI C63.10:2013, KDB558074  
Limit : 20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power)  
Kind of test site : Shielded room

**Test setup**

Test Channel : Low/ Middle/ High for Conducted Spurious Emissions  
Low/ High for Frequency Band Edge  
Operation Mode : A  
Ambient temperature : 20-24°C  
Relative humidity : 50-65%  
Atmospheric pressure : 100-103 kPa

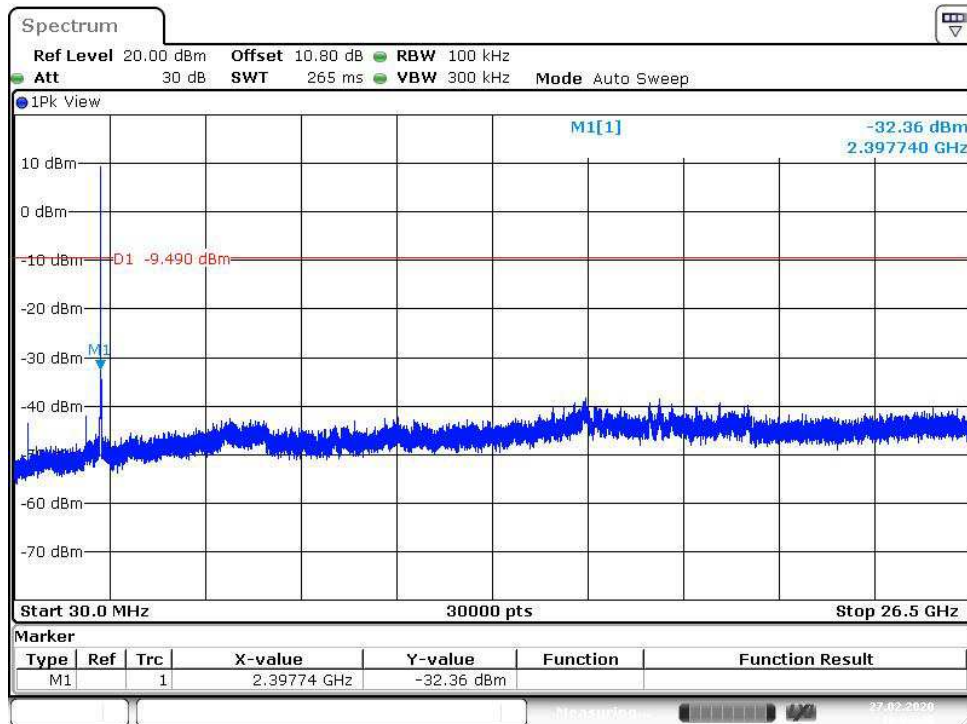
All emissions are more than 20dB below fundamental, details refer to following test plot, and compliance is achieved as well.

Due to the small size of the RF circuit and that there are no inductive components of significant size connected to the antenna port, 9kHz to 30MHz frequency range is not tested based on technical judgment.

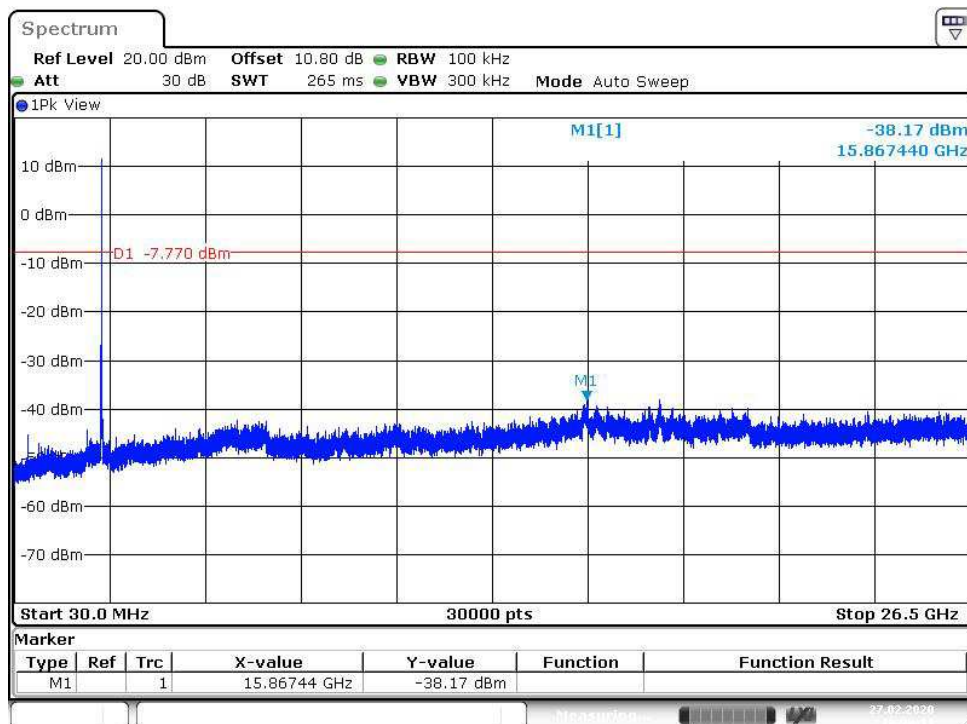
## Test Plot 100kHz Conducted Emissions

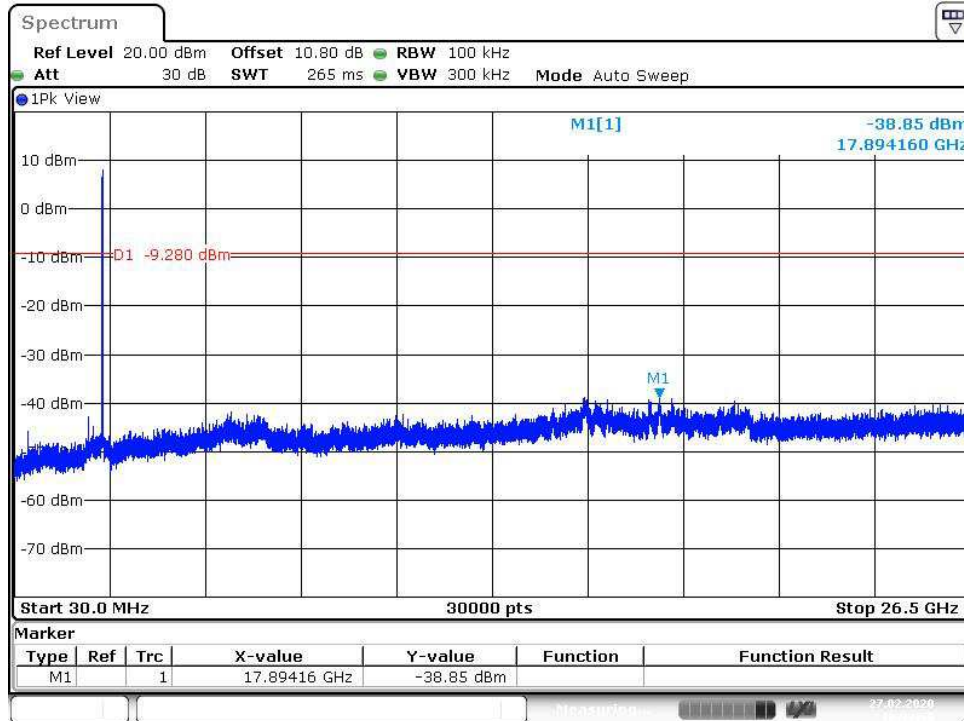
### 802.11b

#### Low Channel

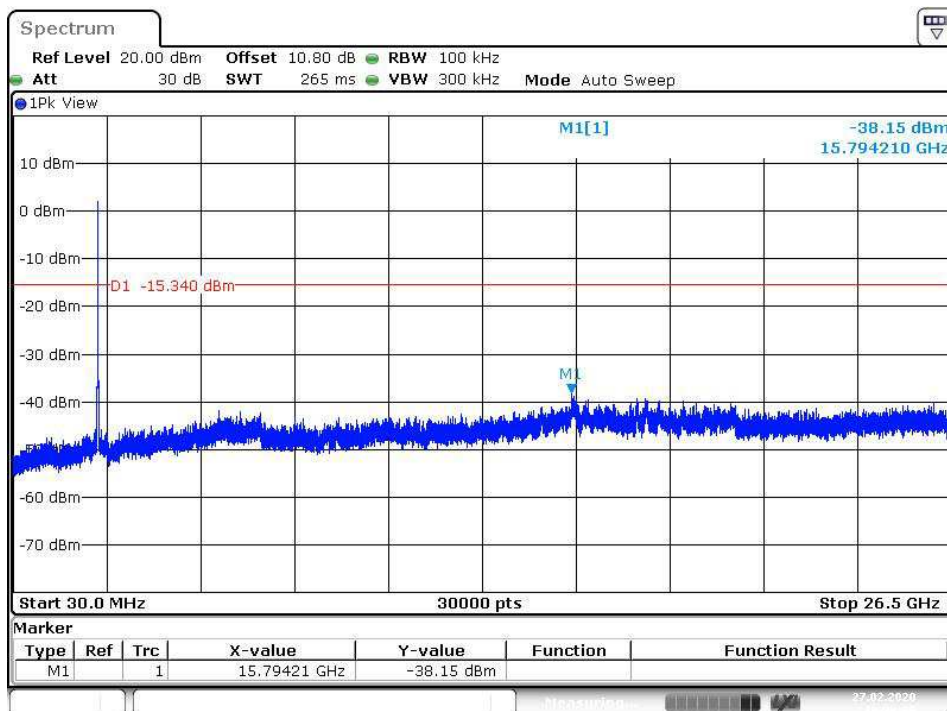


#### Middle Channel

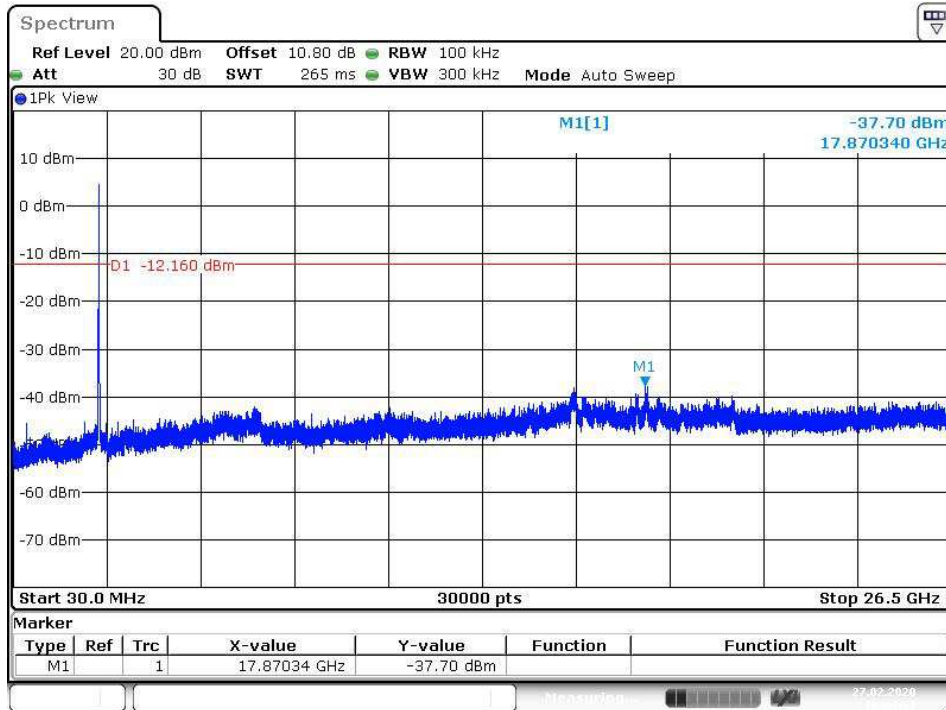


**High Channel**


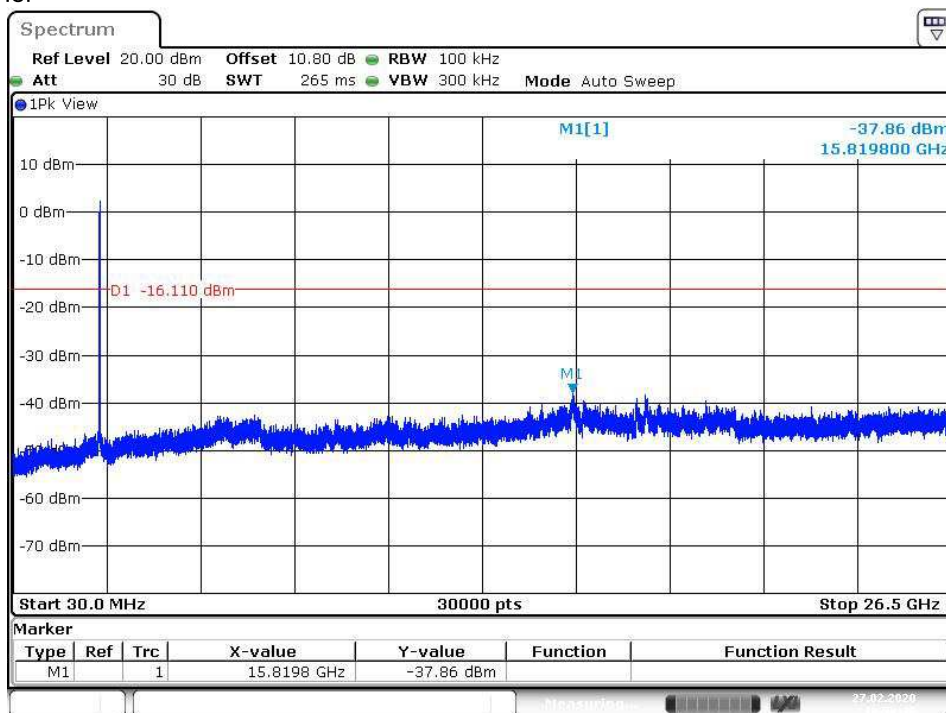
Date: 27.FEB.2020 16:34:00

**802.11g**
**Low Channel**


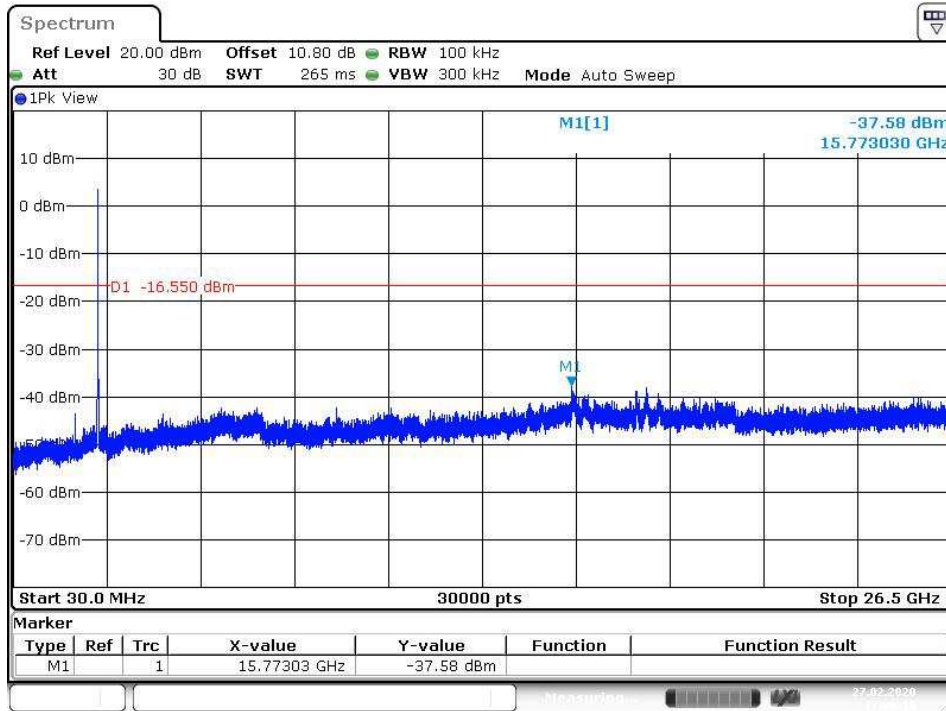
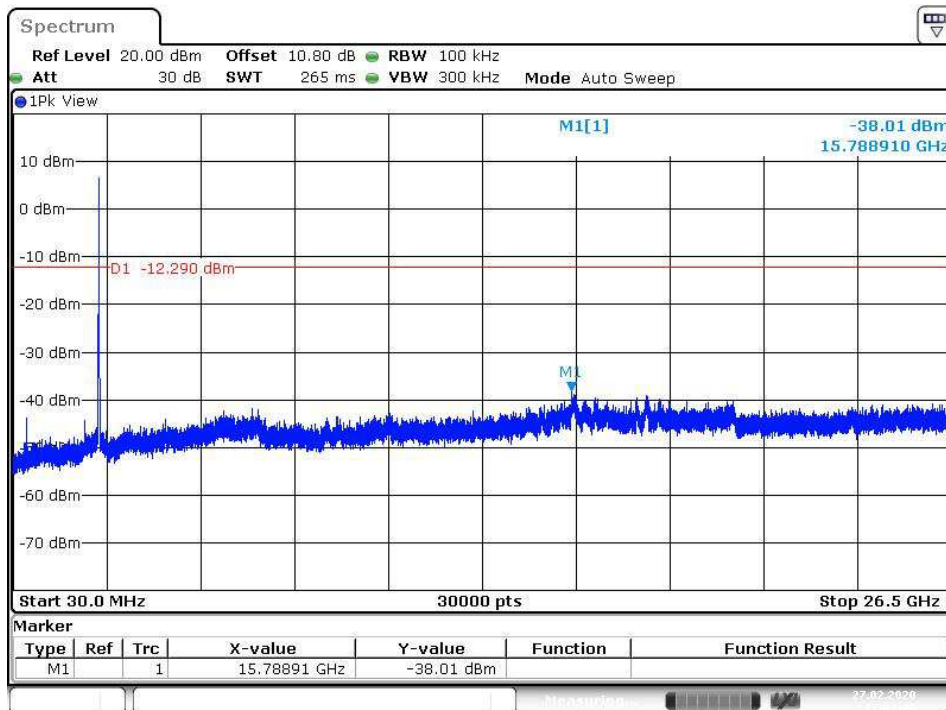
Date: 27.FEB.2020 16:38:09

**Middle Channel**


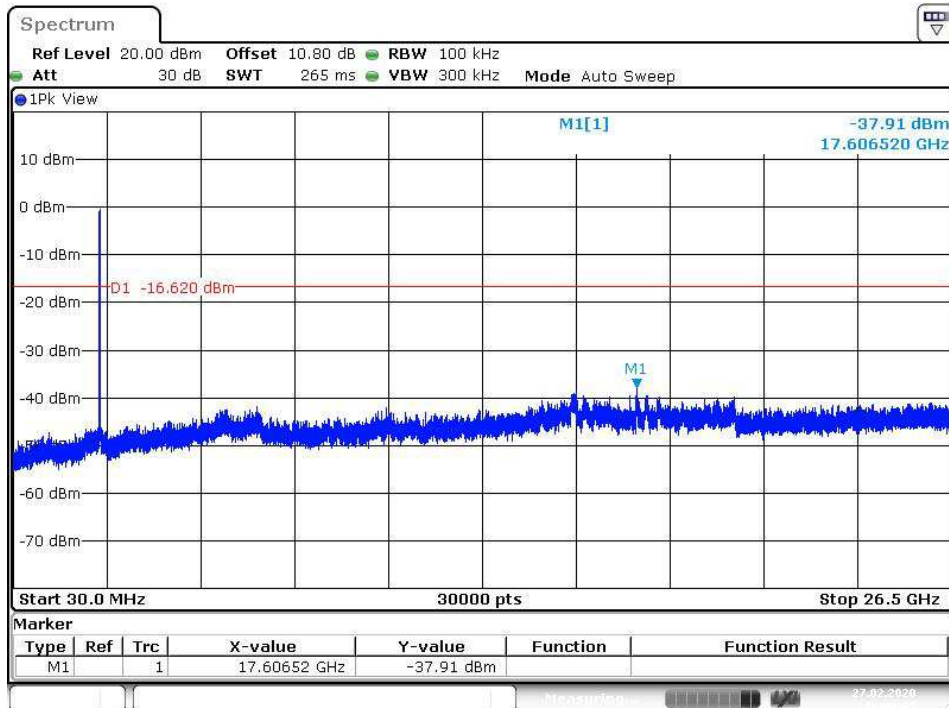
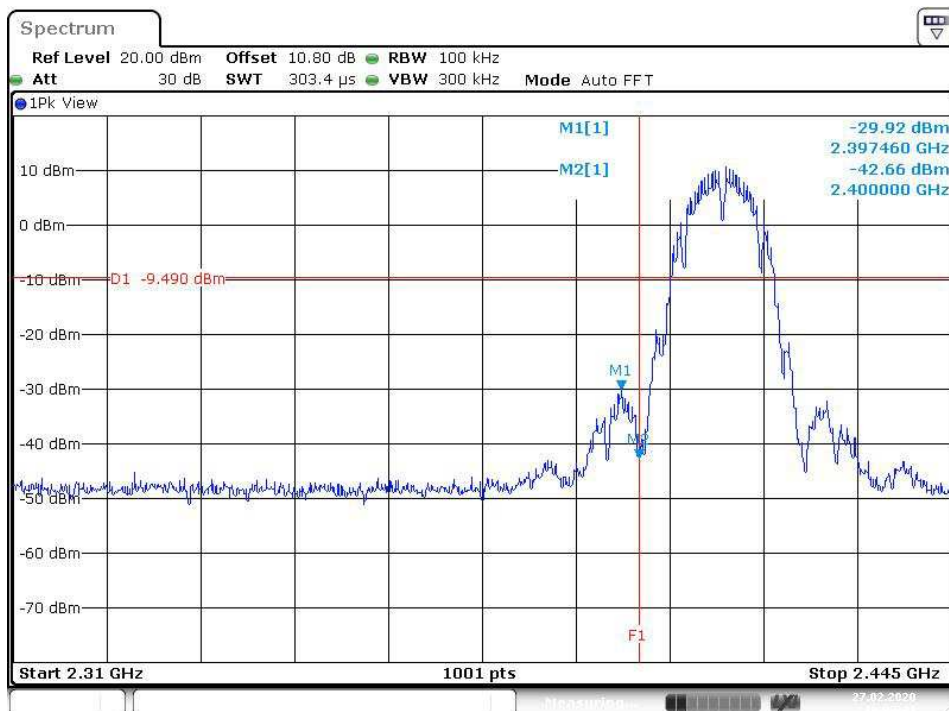
Date: 27.FEB.2020 16:44:51

**High Channel**


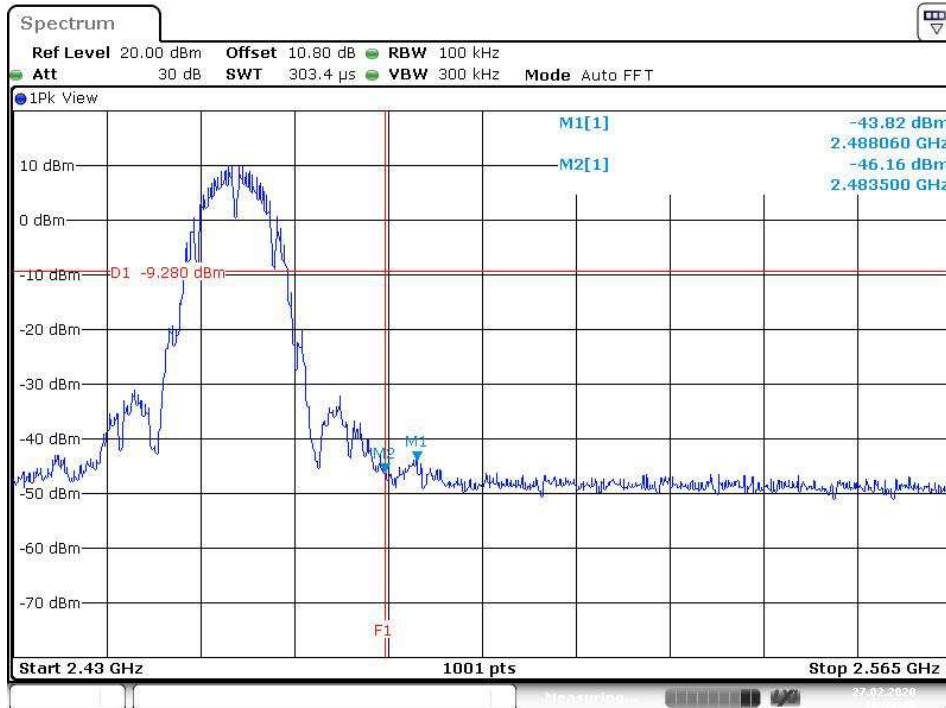
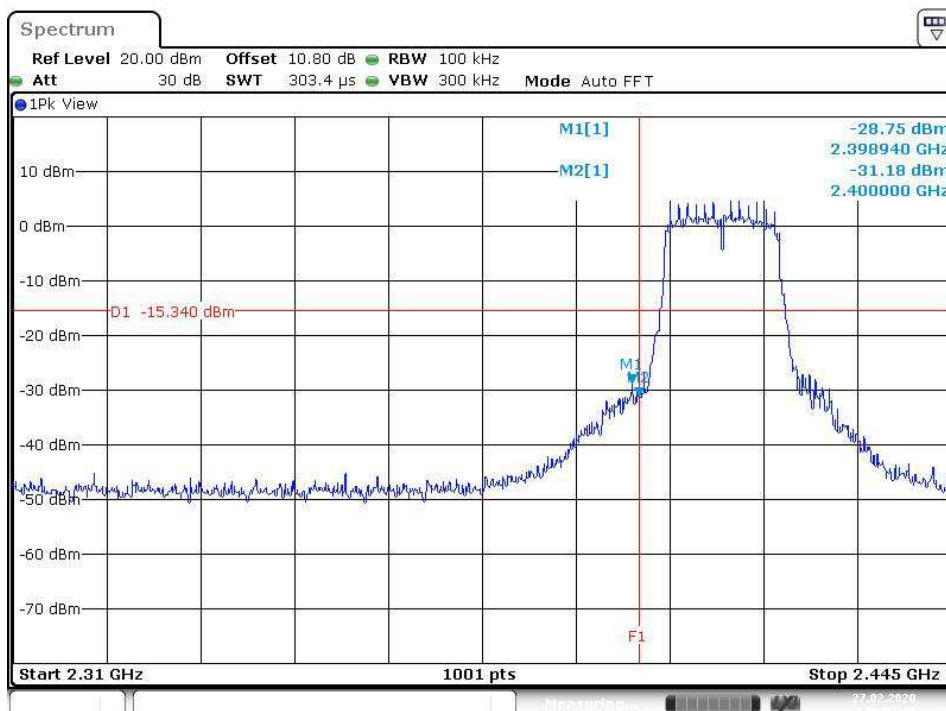
Date: 27.FEB.2020 16:58:30

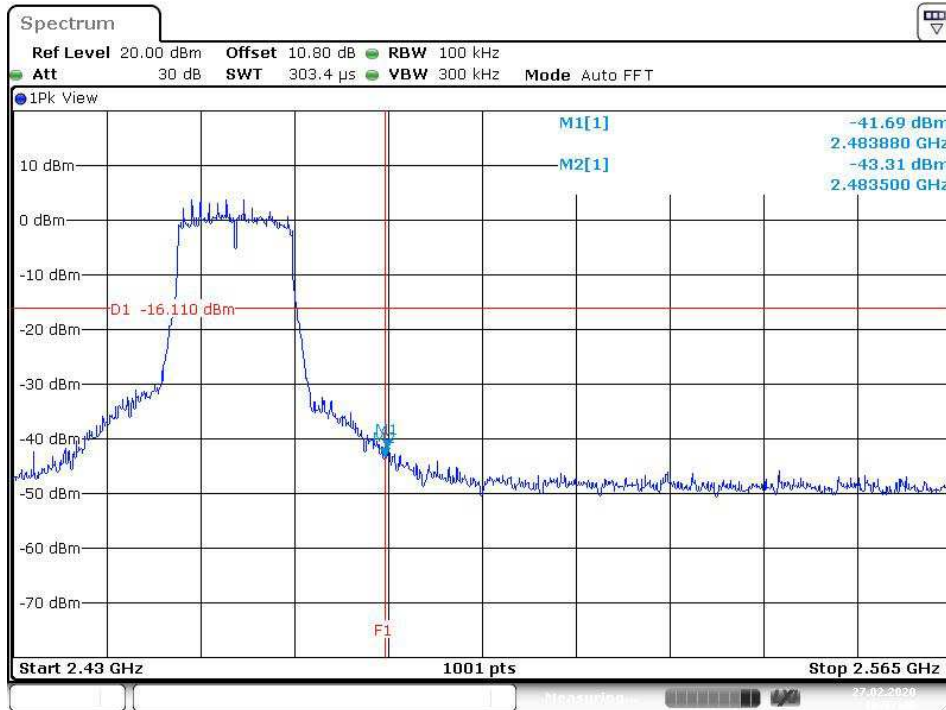
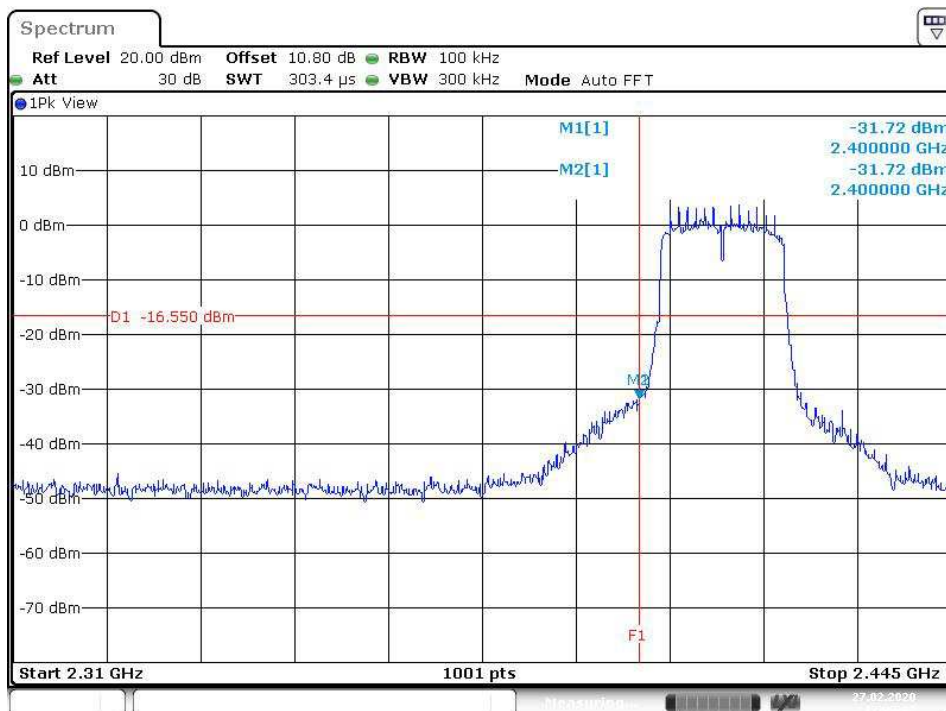
**802.11n HT20**
**Low Channel**

**Middle Channel**


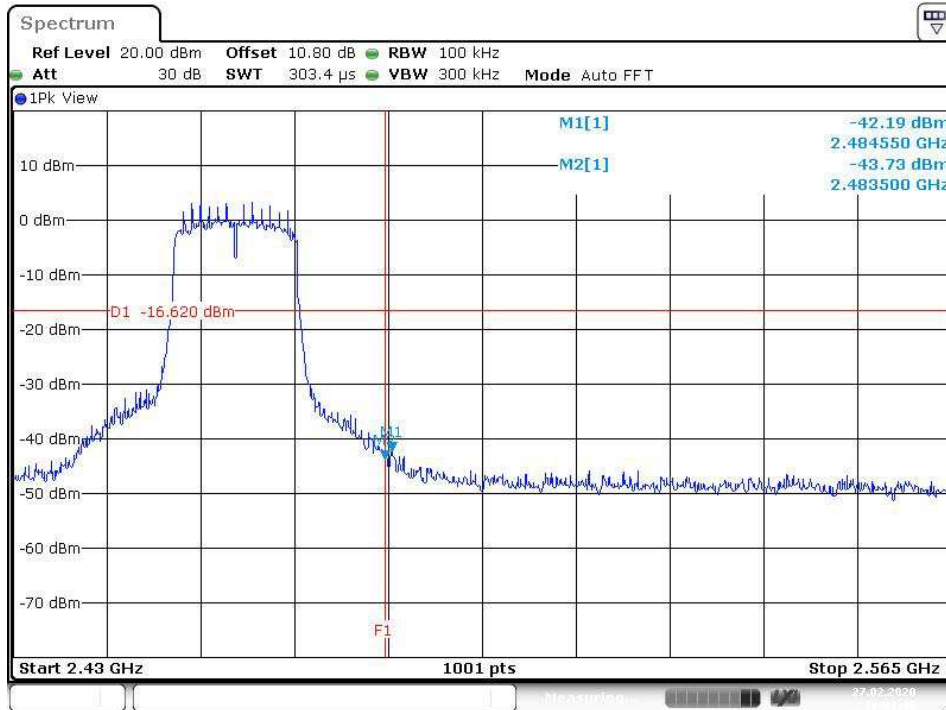


**High Channel**

**Test Plot 100kHz RBW of Band Edge**
**802.11b**
**Low Channel**




**High Channel**

**802.11g**
**Low Channel**


**High Channel**

**802.11n HT20**
**Low Channel**


**High Channel**


Date: 27.FEB.2020 18:01:38

## 5.1.6 Spurious Emission

**RESULT:****Passed**

Test standard	:	FCC part 15.247(d), FCC 15.205, FCC 15.209, ISED RSS-247 i2, 5.5, ISED RSS-Gen 8.9 and ISED RSS-Gen 8.10
Basic standard	:	ANSI C63.10: 2013
Limits	:	Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and ISED RSS-Gen i5, 8.10 (Table 7), must comply with the radiated emission limits specified in FCC 15.209(a) and ISED RSS-Gen i5, 8.9 (Table 5 and 6). Emission radiated outside the restricted and authorized frequency bands must either comply with the radiated emission limits specified for the restricted bands or in FCC15.247(d) and ISED RSS-247 i2, 5.5
Kind of test site	:	3m Semi-Anechoic Chamber

**Test setup**

Test Channel	:	Refer to table 6
Operation mode	:	A
Ambient temperature	:	20-24 °C
Relative humidity	:	50-65 %
Atmospheric pressure	:	100-103 kPa

Factor (dB/m)=Antenna Factor(dB/m)+Cable loss (dB)

Level(dBuV/m)=Reading(dBuV)+ Factor(dB/m)

Testing was carried out within frequency range 9kHz to the tenth harmonic. For details refer to Appendix D.

The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The worst-case Axis orientation is recorded in this test report.

## 5.2 Mains Emissions

### 5.2.1 Mains Conducted Emissions

**RESULT:****Passed**

Test standard : FCC Part 15.207  
FCC Part 15.107  
ISED RSS-Gen 8.8

Limits : Mains Conducted emissions as defined in  
above test standards must comply with the  
mains conducted emission limits specified

Kind of test site : Shielded Room

**Test setup**

Test Channel : 802.11b, 2412MHz  
Operation mode : A

Ambient temperature : 20-24 °C  
Relative humidity : 50-65 %  
Atmospheric pressure : 100-103 kPa

Factor (dB/m)=Antenna Factor(dB/m)+Cable loss (dB)  
Level(dBuV/m)=Reading(dBuV)+ Factor(dB/m)  
Remark: For details refer to Appendix D.

## 6. Radio Frequency Exposure Compliance

### 6.1.1 Electromagnetic Fields

**RESULT:**
**Passed**

Test standard : FCC CFR 47 Part 2 Subpart J Section 2.1091  
 RSS-102 Issue 5, 2.5.2

FCC:

Therefore the maximum output power of the transmitter is 330.37mW < 396mW(Distance: 80 mm), hence the EUT is excluded from SAR evaluation according to FCC KDB publication 447498 D01: Mobile Portable RF Exposure.

Canada:

Separation distance is more than 20 cm, thus mobile device exposure limits can be applied.

**Maximum Exposure for WFI32E01PC/ WFI32E01PE Module:**

Power to Antenna (mW)	330.37 mW
Power to Antenna (dBm)	25.2 dBm
Antenna Gain	2.51 dBi
Power+Ant Gain	588.8 mW
Distance	20 cm
S=	0.117 mW/cm <sup>2</sup>

Limit Canada: 0.542 mW/cm<sup>2</sup>

**Maximum Exposure for WFI32E01UC, WFI32E01UE Module:**

Power to Antenna (mW)	330.37 mW
Power to Antenna (dBm)	25.2 dBm
Antenna Gain	2 dBi
Power+Ant Gain	523.6 mW
Distance	20 cm
S=	0.104 mW/cm <sup>2</sup>

Limit Canada: 0.542 mW/cm<sup>2</sup>

---End---

## 7. List of Tables

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